

Scanning - Shortwave - Ham Radio - Equipment
Internet Streaming - Computers - Antique Radio



Monitoring Times

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Power versus the Planet

In this issue:

- Surround Sound: The Killer App for Digital Radio?
- Student Stations: More than DJ Training
- New Federal Bandplans in Effect

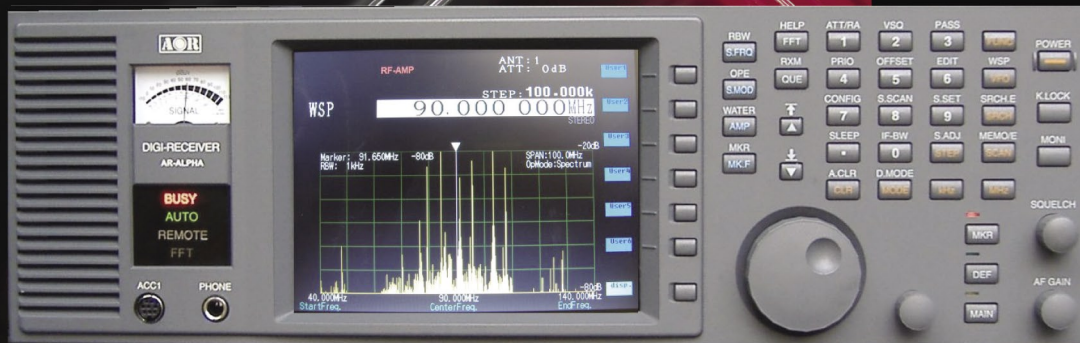
MT Reviews:

- HD Radio Round-Up
- LaCrosse Battery Recharger



AR-ALPHA

Communications Receiver



- Multi-mode unit capable of receiving AM (synchronous), ISB, RZ-SSB, USB, LSB, CW, WFM including FM stereo, NFM, APCO-25 digital, and TV in both NTSC and PAL formats
- 6-inch TFT color panel can display received video signals or depict spectrum activity over a wide choice of bandwidths including a "waterfall" function to show signal activity over a specified time period

Welcome to the Future!

AOR proudly introduces the AR-ALPHA, the first in a new class of professional monitoring receivers! Designed to cover 10KHz to 3.3GHz, with no interruptions,* this receiver features a 6-inch color TFT display, five VFOs, 2000 alphanumeric memories that can be computer programmed as 40 banks of 50 channels, 40 search banks, a "select memory" bank of 100 frequencies, and a user designated priority channel. It includes APCO-25 digital and a DVR with six channels that can record up to a total of 52 minutes audio. Monitoring professionals will appreciate the world class engineering and attention to detail that makes the AR-ALPHA such an amazing instrument.

- Composite video output on the rear panel of the unit
- Selectable IF bandwidths: 200 Hz, 500 Hz, 1 KHz, 3 KHz, 6 KHz, 15 KHz, 30 KHz, 100 KHz, 200 KHz and 300 KHz along with the ability to shift the IF.
- CTCSS and DCS selectable squelch functions
- DTMF tone decode
- Built-in voice-inversion descrambling
- CW pitch control, AGC, AFC
- Auto-notch feature
- User selectable spectrum display function from 250 KHz through 10 MHz in 1 KHz increments. Above 10 MHz bandwidth, it can display 20 MHz, 50 MHz, 100 MHz or 1 GHz, but above 20 MHz bandwidth, no audio will be available
- Resolution bandwidth is also user-selectable in increments of 1 KHz, 4 KHz, 32 KHz, 64 KHz, and 128 KHz.
- Fast Fourier Transform (FFT)
- Rear panel connections include 12 VDC power, RS-232C, USB 2.0, I/Q output with 1 MHz bandwidth, two antenna ports (one SO-239 and one Type N) and up to four antennas may be selected through the receiver's controls with the optional AS5000 antenna relay selector.
- Use desktop or with 19" rack mount

The AR-ALPHA redefines excellence in professional monitoring receivers. No wonder so many monitoring professionals including government, newsrooms, laboratories, military users and more, rely on AOR.



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*Specifications subject to change without notice or obligation.
Documentation required for qualified purchasers in the USA.

A marine receiver like no other.

At WiNRADiO, the innovation never stops.

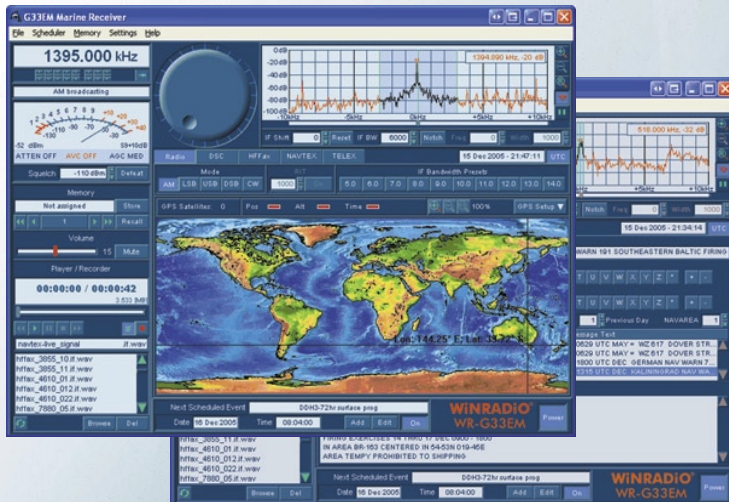
The new WR-G33EM Marine Receiver represents a true breakthrough: It is the world's first software-defined marine receiver.

- Frequency range 9kHz to 30MHz
- AM, LSB, USB, DSB, CW standard modes
- DSC, HF Fax, NAVTEX, TELEX marine modes
- Extraordinary sensitivity
- Excellent dynamic range
- Real-time spectrum analyzer
- Spot-on tuning in 1Hz steps
- Continuously variable bandwidth 1Hz - 15kHz
- Automatic scheduling, recording and playback
- GPS option

Most of the radio signal processing with this receiver is performed in software, using computational signal processing methods, rather than using traditional hardware parts, resistors, capacitors, diodes, etc.

The received signal is digitized as early as possible in the signal processing chain, and further processing, demodulation and decoding of the digitized signal is then performed entirely in software.

There are many advantages to this approach, especially the flexibility of demodulation modes - new modes can be added easily by simply upgrading software. The WR-G33EM also performs better than a comparable conventional receiver, thanks to advanced signal processing techniques which make it possible to implement sharper selectivity filters, more accurate demodulators and decoders than conventional hardware.



WR-G33EM Marine Receiver on-board

The performance of a Software Defined Radio receiver is also more consistent, stable and reliable because component tolerances and aging do not play such an important role as they do in a conventional receiver.

The WR-G33EM receiver also offers far more features and facilities than a typical marine receiver. For example, the real-time spectrum analyzer with continuously variable bandwidth, graphical notch filter and IF recording are just some of the many features which were previously unavailable on a typical marine radio, in particular at such an affordable price level.



For more information visit

www.winradio.com



Lead Story

Power vs. the Planet

By Bob Grove

It is no news to radio geeks that we are avid consumers of batteries. It is also no news that pollution from fossil fuels and disposal of toxic chemicals pose major challenges to the health of the planet. Bob Grove takes a quick peek at some of the alternatives to current energy sources – some very promising and others not so.

Battery technology has also continued to evolve, and in our sidebar story, we update the current batch of myths about recharging batteries. Story starts on page 8.

Cover concept by Bill Grove.

C O N T E N T S

More than DJ Training 11

By Ken Reitz

Several High School Radio Stations in Ken Reitz's home state of Virginia have outstanding programs in radio broadcasting and technology. Most owe their success to dedicated, self-sacrificing teachers. Even though most high school stations broadcast on low power FM stations, you can still tune in to many of them via internet streaming audio.

Surround Sound: The New Frontier for DAB Radio 14

By D. Prabakaran

As echoed in this month's "Round-up of HD Radios," consumer interest in the new digital radios has been lack-luster at best. The same has been true in Europe, even with the introduction of stereo digital audio broadcasting. However, "surround sound" applications are poised for release, and the author speculates that this could be the key to opening up consumer pocketbooks. There are several different approaches, but most modes offer more than just improved fidelity – it's a different experience altogether.



Reviews

Throughout 2007, Ken Reitz has been reviewing HD (digital) radios on the U.S. market. In this **HD Radio Round-up** article, we "round out" the series with a comparison between all the radios reviewed – most inexpensive, best sound, most features, most sensitive, most expensive, etc. (See page 66.)

Since we're not ready to get rid of our batteries yet, the least we can do for the planet is to use rechargeable cells.

LaCrosse Technology's BC-900 intelligent charger comes with a high recommendation from many users – and now Larry Van Horn is a convert, too! (See page 69.)

If you are as tied to the Internet as we are, you'll be interested to know you can customize your browser for your radio hobby. The HamLink toolbar and HamInfoBar toolbars give you one-click access to all kinds of information useful for amateurs and hobbyists. (See *Computers & Radio*, page 72.)



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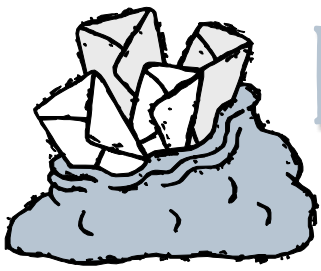
What's New

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LETTERS

TO THE EDITOR

Power to the People

Our January issue often inaugurates the New Year with a look at new technology. In light of heightened concern about global warming, loss of habitat for animals and people, quality of life in the Third World, dwindling supply of fossil fuels, etc., it seemed appropriate to focus – even superficially – on the technology of energy which drives our modern society. We've only touched the surface of the latest research, but I hope your interest is stimulated to continue studying the issues and doing whatever is in "your power" to increase the efficiency of your energy usage.

Pertinent stories in this issue are our feature article on alternative energy sources (*Power versus the Planet*); *Beginner's Corner* which uses the Kill A Watt tool to expose how much "phantom power" is being used by appliances in stand-by mode; *On the Ham Bands* is a review of the ARRL's *Low Power Communication/CW Cub Transceiver Kit* combo; we review an outstanding battery charger by LaCrosse; and we recycle a power supply from junked components in *On the Bench*.

New Communications Editor

I am pleased to announce that Ken Reitz will be adding the *Communications* column to his growing list of writing responsibilities in the pages of *Monitoring Times*. Already a full-spectrum hobbyist and writer, Ken is interested in every aspect of radio, so this is a natural fit.

You may continue to send your newspaper clippings to *MT* headquarters for forwarding to Ken. Email news items may be directed to kenreitz@monitoringtimes.com or I can continue to forward them to Ken from editor@monitoringtimes.com.

No Offense Intended

At least two readers, Maury Midlo and Jim McCulloch, questioned the motivation behind the caption on November's cover photo, which referred to "Israeli Defense Forces female soldiers slouching toward Jaffa..." This was a case of poor editing on my part, as I simply picked up the caption directly from the photographer, but did not so indicate. The phrase "slouching toward Jaffa" apparently refers to a poem by W.B. Yeats entitled "Slouching towards Bethlehem." No doubt political commentary was intended by the photographer, but not by me – I just thought it suited the self-confident stride of the two soldiers!

New NRC Address

If you're ordering from the National Radio Club, please use their new address, which we neglected to update when we reviewed the *NRC AM Radio Log* in the November issue of *MT*. NRC's address is: National Radio Club, P.O. Box 473251, Aurora, CO 80047-3251 (no longer Mannsville, NY). Thanks to Wayne Heinen for providing the update for *MT* readers.

Data on Digital TV

"FYI the 'Ignorance is Bliss' news item (November *Communications*) unfortunately is not 100% correct. Within the past six months I recall reading a post in the email FCC Daily Digest I subscribe to regarding approximately 50-100 TV station owners nationwide requesting FCC waivers from the 2009 cutover date from analog to digital broadcasting. Reasons vary from necessary transmitter equipment non-availability to experienced technical personnel not being available, etc. TV stations petitioning are nationwide and I believe remember reading that the FCC has granted time extensions upwards of a year or more for some TV stations. So, it ain't going to happen 100% nationwide on the 2009 cutover date."

John Wilson

I was unable to locate the document John referenced, but one summary implied that many of the stations being granted extensions are those near the Canadian or Mexican borders. We also note the FCC now has a dedicated website for questions about digital TV and the consumer coupons at www.dtv.gov

Eric Hopkins of Ayers, MA, also asked some additional questions regarding the November HDTV *Communications* brief.

"Why HDTV? Will audio still be receivable on current TV-band portable radios and scanners? Will the same channel assignments still be used? What is the classification for the new DTV system since it won't be NTSC, PAL, etc.? How soon will scanner and hobby receiver manufacturers incorporate DTV reception?"

Bob Grove replied: "There are currently some 1400 US TV stations authorized to broadcast high-definition television (HDTV), usually referred to as digital television. DTV provides a sharper picture (more lines per inch and more rapid refreshing of the image), better color (higher frequencies provide wider bandwidth), no fading or interference (it's all or none with DTV), and superior audio. I'm sure that the prospect of manufacturers having a brand-new market thrust plays no minor part in the drive for DTV!"

"The audio is also digital, Dolby 5.1 'Surround Sound' (See p.14 for more on this audio mode - ed.). It's unlikely that we will see many hobby-level radios or scanners with that capability in the near future because of the relatively few scanner/SWL users who want to pay a premium for local broadcast reception.

"The frequency bands are the current channels 2-50; channels 51-69 are being auctioned off by the FCC to other services. High compression DTV allows smaller bandwidth than the old analog 6 MHz.

"The working classifications for the various systems (there are three in contention by the various networks) are 1080, 720 and 480, enumerated for the number of active lines that make up a picture. Each has its advantages and disadvantages with regard to refresh rate (24, 30 or 60 frames/sec.), progressive vs. interlaced scanning, and aspect ratio (16:9 or 4:3). Video is MPEG2 or 4 at the moment."

A Grateful Canadian

"I'm a 'former' reader of *Monitoring Times*, and I say that because my finances along with rising costs of everything had made it so I had to finally cancel my subscriptions to both *Monitoring Times* and the *Satellite Times*. ... the cost of things being much higher because... with the pathetic performance of our dollar to your dollar, it was traditional and expected.

"That was then, this is now. For the first time since the mid-1970s our dollar is of equal value to the U.S. dollar. That has many people scratching their heads. Why do prices not reflect this? ...

"I was pleased - VERY pleased to come across a copy of *MT* the other day at a newsstand where it was clearly marked for all to see:

USA: \$5.50

Canada: \$5.50

"It was so wonderful to find someone out there who has taken notice of current events instead of trying to take advantage of 'traditionally' higher prices in Canada."

Sean Sudol, Barrie Ontario Canada

This column is open to your considered comments. Opinions expressed here are not necessarily those of Monitoring Times. Your letters may be edited or shortened for clarity and length. Please mail to Letters to the Editor, 7540 Hwy 64 West, Brasstown, NC 28902 or email editor@monitoringtimes.com
Happy monitoring!
Rachel Baughn, Editor

WORLD RADIO TV HANDBOOK

WRTH 2008

We are delighted to announce the publication of the 2008 edition of *World Radio TV Handbook*, the best-selling directory of global broadcasting on LW, MW, SW & FM

The Features section includes a detailed description of rebuilding a Racal RA1792, and the story of two very different stations in the Falkand Islands and Zimbabwe.

The remaining pages are, as usual, full of information on:

- National and International broadcasts and broadcasters by country with frequencies, powers, languages, station addresses, email, web, phone and fax, leading personnel, QSL policy, and more
- Clandestine and other target broadcasters
- MW frequency listings by region
- International and domestic SW frequency listings as well as DRM listings
- International SW broadcasts in English, French, German, Portuguese & Spanish, listed by UTC
- Equipment reviews, *Digital Update* and more
- A further revision of TV by country
- Reference section with Transmitter Site Location Table, Standard Time & Frequency Transmissions, DX clubs, Internet Resources, and much more

Available December 2007

SOME COMMENTS ON WRTH 2007

World Radio TV Handbook 2007 continues to set the radio reference standard. It remains the most comprehensive and authoritative source available to guide the listener. – *Gayle Van Horn, Monitoring Times*

The UK publisher of WRTH has continued to make substantial improvements to the content and quality of the book every year since taking it over, and the 2007 edition is once again the best and most comprehensive ever – *Richard Dixon, Radio Netherlands Media Network*

La World Radio TV Handbook, constituye una de las herramientas más valiosas para quienes deseen gozar de la escucha radiofónica en especial, y adentrarse en ese mundo tan particular de las emisiones...Este Manual, es, en verdad, un paradigma valiosísimo, que en cada aparición, refleja el perfeccionamiento de la labor de sus hacedores – *Prof. Charles Gerez, Argentina*

I just received my 2007 edition. Thank you for a wonderful publication – *Jim Siers*

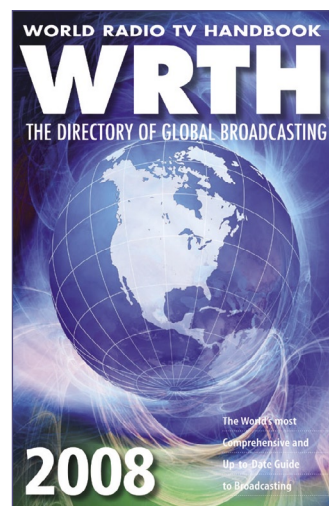
I don't know how I managed without this fantastic publication for so long! – *Adam Toynton, UK*

I love it the way it is – *Don Vincent, USA*

WRTH is just getting better and better every year – *Daisuke Endo, Japan*

The best buy ever! This book is marvellous, very complete – *Hannes Grünsteidl*

It's a greatest radio source I ever met – *Igor, Russia*





COMMUNICATIONS

by Ken Reitz

AMATEUR RADIO/SHORTWAVE

Amateur and Shortwave at WRC-07

The World Radiocommunications Conference, organized by the International Telecommunications Union and which meets every four years, met this past November to discuss many issues of interest to amateur radio and shortwave enthusiasts.



An initial report from the ARRL on the ham side of the issues was disappointing. You can read the latest on WRC-07 at League Headquarters: www.arrl.org.

It's also not likely much will be resolved regarding digital shortwave broadcasting using DRM during this conference. Aside from voicing concern about congestion in the 4 MHz to 10 MHz portion of the shortwave band, there is little indication that anything regarding this issue will be resolved. Wait until WRC-11.

WRC-07 Saves C-Band

The recently completed 2007 ITU World Administrative Conference (WRC) decided to save the C-band frequency spectrum (3-4 GHz) for fixed and mobile satellite services. The WRC was under a lot of pressure from commercial groups who sought to take over those frequencies for broadband wireless Internet development. The use of those frequencies for broadband would have meant the addition of terrestrial-based transmitters which would have caused interference to broadcast satellite users. The two services can't coexist because of the interference potential. WRC chose to preserve those frequencies for the existing broadcast satellite industry which has been using C-band for delivery of broadcast, cable-TV, and contract video distribution of television services for several decades. The effect of the WRC decision means mandatory enforcement by national regulatory agencies. In the U.S. that means the FCC must also preserve those frequencies against petitions from broadband companies.

Motorola Acquires Controlling Interest in Yaesu

In a complicated business deal, Motorola U.S.A. has announced it intends to buy a controlling interest in Vertex Standard, Co., Ltd.,

the parent company of Yaesu. Dennis Motschenbacher, K7BV, Yaesu Executive Vice President for amateur radio sales in North America was quoted by the ARRL web site as saying that the proposed deal would be "...a very good thing for amateur radio in general and Yaesu customers in particular... There is absolutely no reason to have the slightest concern about equipment warranties and the continuation of support for our products."

New IARU Region 2 Coordinator

The International Amateur Radio Union has appointed Bill Hays WJ5O, as the new HF beacon coordinator for Region 2, which includes the United States. Hays, a long time 10 meter beacon operator, has helped many American hams set up 10 meter propagation beacons over the years. He replaces Peter Jennings VE3SUN, who wished to step down. Hays has collected virtually everything anyone would want to know about 10 meter beacons on his web site: <http://userpages.troycable.net/~wj5o>

BROADCASTING

Are We Watching HDTV Yet?

Nationwide growth in U.S. homes with at least one HDTV-capable TV set has been significant over the last 12 months, but there are still fewer homes with such sets than without them. According to Leichtman Research Group (LRG), a company that specializes in research and analysis of broadband, media and entertainment industries, 20 per cent of homes that do have HDTV sets erroneously think that they are watching HD programming when they are not.



According to a press release from LRG, 53 per cent of all HD households are watching via cable or satellite TV and only 4 per cent are watching solely over-the-air digital TV signals.

Twenty per cent of those questioned in the survey, released on November 7, 2006, said they "...believe that their household currently has a high definition DVD player - a figure that, if accurate, would represent a much greater total than the number of high definition DVD players actually sold to date." The survey points

out that the industry needs to do a better job of disseminating information about HDTV to the public. According to LRG, only 41 per cent of HDTV owners were told how to receive HD programming when they purchased their set.

FCC to LPFM Community: The More the Merrier

Speaking before the House Committee on Small Business, FCC Chairman Kevin Martin said Low Power FM "...provides a lower-cost opportunity for more new voices to get into the local radio market." This is not likely the kind of news that existing commercial, or for that matter non-commercial, FM radio station wanted to hear. His comments come at a time when these stations are already reeling from a very crowded band, stiff competition from satellite radio, Internet radio and MP3 players. To add to the competition, the FCC just recently closed applications for proposed new full power non-commercial FM stations. Some 3,600 applications are on file from the brief window that was opened in October 2007. Action on those licenses will likely happen later this winter or spring. Left unsaid is how the FCC will ask all newcomers to deal with the eventual switch to Ibiquity's HD-Radio system.

But wait, there's more! The FCC has also proposed an amendment to the rules that would allow AM stations to broadcast on FM translators. These translators would be strictly "fill-in"



transmitters designed to fill the gaps in reception such AM stations may be suffering. The FCC would require the signal to be within a 25

mile radius of the AM transmitter site. The proposed new rules would also allow AM daytimers to originate programming on those fill-in FM translators at night.

PUBLIC SAFETY

We Be Jammin'!

It's a global problem. People yakking loudly about some of the most intimate details of their lives in public places to the irritation of everyone around them. I was once in a Starbucks coffee shop where a woman was chattering away about absolutely nothing in a loud voice. Suddenly her purse started chirping. "Hang on, I've got another call," she announced loudly then reached into her purse and retrieved yet another cell phone. She had one cell phone on each ear and was positively aglow.

More recently I was standing in a grocery store looking at various cuts of meat when the guy next to me announced, "I don't like pork chops." I looked at him and he continued, "Do you want me to buy steak instead?" It was only when he turned his head that I saw he had one of those Blue Tooth phones stuck on his ear.

The urge to engage in a little electronic vigilantism is also global. A report in the *New York Times* last November detailed the widespread use of inexpensive cell phone frequency jammers. According to reports, most of the units are made in India where such devices are not illegal. Two types of these jamming devices are showing up all over the country. Most are about the size of a cigarette pack and cost \$50, while much larger and more powerful units are selling for as much as \$1,000. Both are illegal to own and operate in the U.S. and can bring as much as \$11,000 in fines from the FCC for a first offense.

Such possible financial loss hasn't stopped individuals and even businesses from buying and using the devices which flood an area within a 30 foot radius of the jammer, causing calls to be dropped. The larger units can cancel calls within a small business such as a restaurant. Intermittent use of the device can make it all but impossible to detect.

"Attention Scanner-land, the Bad Weather has Passed"

A report in the Peoria, Illinois *Journal Star* tells about an emergency dispatcher coping with the large volume of phone calls during a bout of heavy storms one night last year. In the piece Frank Radosevich II wrote: "...even after the skies cleared, the dispatcher's phone was still ringing. Reaching for his microphone, he announced across the airwaves, 'Attention scanner-land, the bad weather has passed.' Then abruptly, his flood of phone calls dried up."

The report went on to give both sides of the scanner monitoring hobby. According to Radosevich, citizens found it reassuring to hear the police in action and the local police chief was quoted as wishing their frequencies were secure. It went on to report that the chief might get his way. The area had received \$11.2 million dollars for a complete system upgrade to include new digital equipment that could be in place by 2010.

Car 1254207, Where are You?

The doggonedest thing happened in Washington, D.C. this past fall. According to an article in the Washington *Post*, transmissions from the police radio in a U.S. Park Police cruiser, which was thought to be in a local auto shop for repair, alerted the agency that the cruiser was, in fact, on the lam. The report said that the 1998 Ford Crown Victoria had full Park Police markings, overhead emergency lights and the designator "K9 6" painted on the rear quarter panel. The rear seat had been removed and replaced with a dog cage. Park Police have searched doggedly but the missing vehicle still hasn't been found. Hmmmm, I wonder if anyone's seen McGruff, the Crime Dog lately?

Radio Towers Save the Day

A report in *BoatU.S. Magazine* from November 2007 told of a harrowing incident at sea for the crew of a 26 foot sailboat last summer. It seems they were miles off the California coast with all electrical systems down and their only communications device was a 5 watt hand-held VHF marine transceiver. According to the article:

"While the Coast Guard couldn't pick up the weak transmission, the 24 hour call center of BoatU.S. Vessel Assist heard the skipper's broadcast, thanks to its network of elevated radio towers located on the coast and on the offshore islands such as Catalina. This system of radio towers, known as 'high sites,' allows dispatchers to not only hear VHF transmissions from all over the coast, but their directional capabilities also can help isolate the location of the hailing vessel."

Even using these towers, it took three hours to find the sailboat's general vicinity, but that only narrowed the location down to 100 square miles. The article went on to describe a series of fortunate events that finally allowed the Coast Guard to send out a helicopter and a C-130 to effect the rescue. The craft was eventually towed 45 miles back to a safe harbor.

While the article goes on to warn boaters about making the right preparations for being so far at sea, it also shows that even the smallest communications device is better than nothing and that there's no substitute for vigilant monitoring of all bands. Kudos to BoatU.S. Vessel Assist for having such a system in place and volunteers who knew what to do.

CONSUMER'S CORNER

Coby Electronics Player Recalled

The U.S. Consumer Product Safety Commission announced the recall November 8, 2007 of Coby Electronics' TF-DVD170 and TF-DVD176 portable 5" TV/AM/FM/DVD/CD/MP3 players because of a danger of overheating and posing a fire hazard. An estimated 12,000 units were sold in discount, electronics, music, toy and office supply stores from May 2006 through October 2007 for \$140 to \$170. Consumers are urged to stop using the device and contact the firm at their toll-free number 877-231-9240. According to the CPSC press release, Coby Electronics Corp. has received three reports of the units overheating, one of which involved minor property damage from a fire. No injuries have been reported.

Toshiba Recalls AC Adapters

The U.S. Consumer Product Safety Commission announced the recall October 9, 2007, of Toshiba brand AC adapters sold with portable DVD players because the adapters can fail, causing the portable DVD player to overheat, posing a burn hazard to consumers. The CPSC reports that Toshiba has received two reports of minor damage to the bottom of the DVD player.

No injuries have been reported.

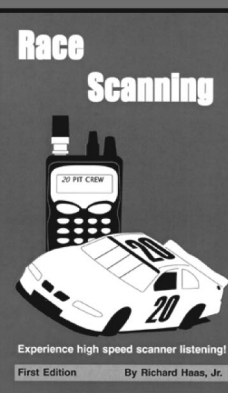
The specific adapter involved was sold with the portable DVD player model SD-P1600. The name Toshiba and model number ADPV16 can be found on the side of the adapter. Some 142,000 devices were sold in consumer electronics stores nationwide from January 2005 through April 2006 for between \$200 and \$230. Consumers are urged to stop using the adapters and call the Toshiba customer service hotline for a replacement at 877-290-6064.

Consumer Reports Looks at HDTV Sets

If you weren't swept up into the hysteria of buying a new HDTV set during the holidays, you now have the time to peruse the December issue of *Consumer Reports* magazine which looks at which sets have the best and worst repair records during the first years of use. The survey covered over 90,000 sets purchased from 2004 to 2007. If a copy is no longer available at your local newsstand, you can read it in most public libraries.

"Communications" is compiled by Ken Reitz, KS4ZR (kenreitz@monitoringtimes.com) from newscippings and links supplied by our readers. Many thanks to this month's fine reporters: Anonymous, Harry Baughn, Alokesh Gupta, Norman Hill, Robert Kipp, Bennett Kobb, Jerry None, Doug Robertson, Robert Thomas, Larry Van Horn, Ed Yeary.

Race Scanning



Chapters:

- History of race comms.
- What you can hear
- Racing terms
- Racing flags
- Choosing a scanner
- Tips and tricks
- Racing frequencies

By Richard Haas, Jr. Listening to a scanner radio at the track adds a dramatic new element to the race fan's experience. This book will help you be properly equipped and informed to enjoy the race from a new perspective. Listen to, and understand exciting real-time transmissions from the driver's seat and support communications from behind the scene. Printed September 2003 with up-to-date frequencies. #0031 **Only \$4.95** (+\$2.00 ship)



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Power versus the Planet

Alternative Electricity Sources

By Bob Grove W8JHD

As civilization becomes more and more technological, it also becomes more wasteful. We live in a throw-away society, and the strain on the limited resources of our planet is beginning to show. We often refer to conservation-friendly policies and products as “green,” a metaphor for Earth’s shrinking forests and plant life.

While portable electronic devices (PDAs, iPods, MP3 players, notebook computers, handy-talkies, portable radios and scanners, digital cameras, pagers, cell phones, and many more) are becoming less power hungry, they are also growing smaller, demanding denser battery packaging while still maintaining adequate lifetime between battery charges or replacement.

A recent incentive for new battery chemistry is being offered by the Department of Defense – a \$1 million prize for the individual or organization that can deliver a wearable prototype that can deliver 20 watts for four days, with peak outputs of 200 watts, and weighing no more than 8.8 lbs. The product will be used to power personal electronics gear like radios, satellite navigational instruments, and night vision goggles. For more information, see: www.dod.mil/ddre/prize/topic.html.

But battery packs are composed either of throw-away (primary) cells, or rechargeable (secondary) cells. In either case, power density per unit volume is the key driver for new battery development. There are other considerations as well, such as adequate voltage, weight, safety (explosive, toxic, heat) and, of course, cost.

Finally, there is the question of battery disposal; our planet is gradually becoming poisoned by toxic wastes, and battery chemicals are one prominent source. Consumers should always pay close attention to the disposal recommendations (and in some states legal regulations) printed on their labels or accompanying paperwork.

Let’s take a look at both the common and the exotic sources of electrical energy as they are used directly to power their appliances, or to charge energy storage devices.

Battery Applications Vehicles

Sure, a car can run on throw-away flashlight batteries, but not very far or for very long! For such applications we need high currents (amperage), and typically 12 or 24 volts of direct current depending upon the mode of transportation.



Fortunately, since powered vehicles have been around for more than a century, their battery requirements have been pretty well ironed out, and the basic technology will be with us for some time to come.

At present we use wet batteries with sulfuric acid as the electrolyte; such batteries last for several years, developing currents of several hundred amps for short term starting, but gradually losing their current capacity as the acid eats away the lead electrodes within.

Sulfuric acid has its own set of additional problems. Highly attracted to moisture, its fumes combine with air-borne water molecules, corroding battery terminals, connectors, and



other metallic parts with which it comes into contact. And it’s toxic.

Portable Electronics

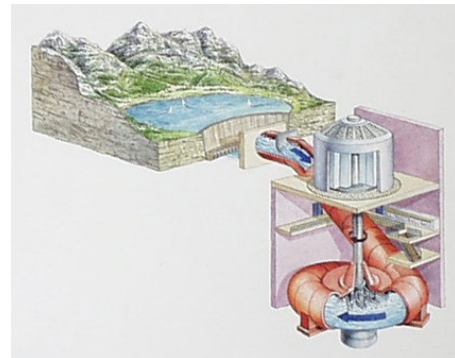
Your favorite pocket- or belt-worn electronic device probably has either replaceable alkaline cells, or a rechargeable nickel-cadmium (NiCd) or lithium ion battery. Newer batteries like lithium polymer are coming along.

Energy Sources

So what are the choices for energy production and storage at present? Let’s take a look at some of the batteries and charging systems currently available.

Electromagnetic

When a conductor moves through a magnetic field, an electric potential is produced between the ends of the conductor; this is the basic magneto or generator for the production of commercial power. The rotating force may come from water moving through a turbine or across blades (hydroelectric), from a fossil-fuel burning motor (motor generator), steam (controlled nuclear fission, coal, hydrothermal/geothermal), or wind (windmill turbines). The November 2007 issue of *Popular Mechanics* described a prototype of a non-turbine wind generator for small-scale applications in Third World countries.



Electromagnetic power generation can be as simple as turning a hand crank, as with old-fashioned telephone ringers or new-fashioned emergency radios and flashlights.

Solar

A voltage is produced when light strikes the surface of certain (photovoltaic) substances; silicon is the most notable example. With the abundance of sunlight bathing the earth, solar power is the energy of choice for many environmentally-conscious inhabitants. Once thought limited to an efficiency of only about 20%, newer technologies are pushing this boundary higher.



In addition, formerly rigid, fragile photovoltaic substances are being deposited on more flexible, less vulnerable supporting materials.

Chemical

Chemistry offers a seemingly infinite source of possible combinations of atoms to form electrically-charged molecules, many of which generate a usable electrical potential. The classic example is when zinc and carbon electrodes are immersed in hydrochloric acid – the basis of the standard flashlight cell, from AAAA miniatures through the big D. The electric potential developed as a result of this combination produces roughly 1.5 volts; take a string of 6 of those current-generating cells and you have a 9 volt battery.

Chemical variants of dry cells and batteries include alkaline, nickel-cadmium, nickel-metal hydride, mercury, silver, lithium ion, lithium-sulfur, lithium polymer and more. But the chemical process is gradually destructive, as permanent recombinations of molecules erode the electrodes, destroying the electrical potential in the closed system.

Since the chemical is soaked up by a spongy matrix, we call this a “dry” cell or battery, but high current applications require a more robust system which is found in wet cells like the six, 2 volt, sulfuric acid/lead cells that make

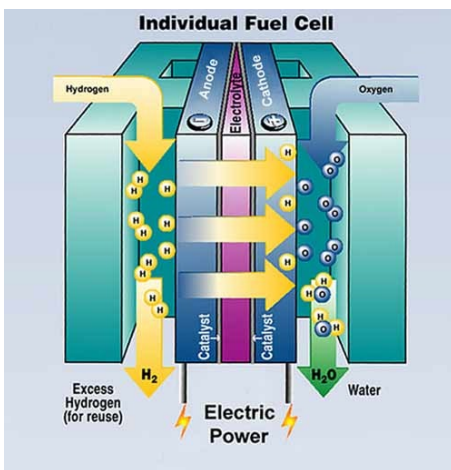


up your car battery.

Readers interested in learning more about choosing the best dry cell or battery for portable electronics may wish to visit this website: www.imaging-resource.com/ACCS/BATTS/BATTS.HTM.

Fuel cell

The production of electricity during the chemical combination of hydrogen and oxygen is the cell of the future, but containment systems so far have been costly. Recently, however, Millennium Cell Inc. and Horizon Fuel Cell Technologies have demonstrated a 50 watt prototype which will provide continuous power for 10 hours in a chemical hydride canister. It is intended for emergency applications during power blackouts and disaster relief, but can motorized power applications be far away?



The government is encouraging rapid development of fuel cells for vehicles, as evidenced by a recent Department of Energy (DOE) award of \$100 million in research funds to more than two dozen institutions and corporations: www.energy.gov/4401.htm.

Capacitive

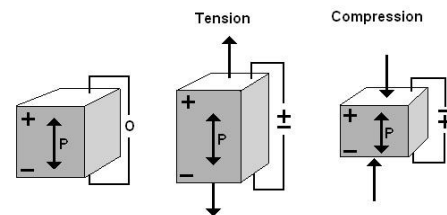
Capacitors (historically known as condensers) can store an electrical charge as well by using chemicals (electrolytic, tantalum) or insulators (mica, paper, Mylar, or even air) to separate their plates.

The problem with capacitors as a regulated source of stored energy is their discharge characteristic: They continuously drop in voltage rather than maintaining a stable voltage like batteries do.



More Exotic Energy Sources Piezoelectricity

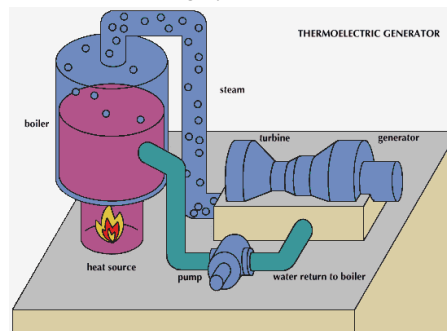
The Piezo effect is well documented: Some crystalline materials, when struck or placed under pressure, produce an electric potential. Quartz-crystal oscillators are used in radios and computer microprocessors, and Rochelle salts are found in the spark generator for gas grills!



Even walking on dry sand on the beach produces piezoelectricity as the grains grind against each other. The electrical noise generated with each footstep can be picked up by an extremely low frequency (ELF) receiver, or even an audio amplifier with a high-impedance probe.

Thermoelectricity

Some combinations of metals produce electricity when heated; a good example is the bimetallic junction of brass and steel. But unless the source of heat is free (as in sunlight, geothermal or hydrothermal), the cost of fueling such a device is highly inefficient.



Frictional (static) electricity

A cold, dry winter day invites an unpleasant shock for anyone walking across a carpet and touching a metal doorknob, or sliding out of a car seat and then grabbing the handle! Frictional electricity has been studied for many centuries by notables like Ben Franklin with his lightning-charged kite key, and by early Greeks examining the properties of the electrophorus, a metal plate touching a layer of resin that had been rubbed by cat fur.

More spectacular are the sparks displayed by the crank-driven Wimshurst machine, comprised of two glass discs spinning in opposite directions with fine brushes rubbing against metal-foil patches on their surfaces. The electrical energy is stored in two glass capacitors (Leyden jars), gradually building in potential until an impressive blue spark snaps between the machine's electrodes, discharging the energy.

Atmospheric

Most visible as lightning discharges from cloud to ground or cloud to cloud, atmospheric voltages can reach astounding potentials. So

far, however, its only recorded use is in Mary Shelley's fictional *Frankenstein*! Nonetheless, an elevated, insulated wire attached to a metal ball or plate will display a voltage when compared to a ground rod. The intensity will vary depending on storm conditions and humidity.

Radio hobbyists and broadcast professionals alike have witnessed corona discharges on large antennas, and the arcing produced across transmission lines from atmospheric electricity.

Biological

Even life processes generate voltages. Bio-cells have been proposed as a possible alternative energy source. Even bioelectromagnetism is produced when magnetic bacteria spin in the presence of a conductor! Nerve impulses are electrochemical in nature.

Perhaps these minute sources can be harnessed in the future for microelectronic implants.

The disadvantages of the exotic sources of electrical energy are many: their voltage is much too high (static and atmospheric), or the current is much too low (bioelectric), or they are dangerous, or they are too brief, or they are unreliable, or their efficiency is too low, or their performance depends upon environmental changes, or they are prohibitively expensive.

In Conclusion

The foreseeable future will likely witness only gradual improvements in four presently-viable technologies – chemical, solar, electro-magnetic, and fuel cells.

So why aren't we seeing more rapid growth of these sources in commercial use? Aren't they excellent alternatives?

The troubling delay in the implementation of newer power-producing technologies is both financial and political. Major, worldwide, corporate industries are heavily vested in older technologies and are actively opposed to the evolutionary changes which would adversely affect their profit-driven corporate interest. Their influence on their respective government policies is considerable.

Perhaps the foreboding specter of global climate change will shake the inertia of such resistant, tunnel-visioned giants. Time will tell. But how much time do we have left?

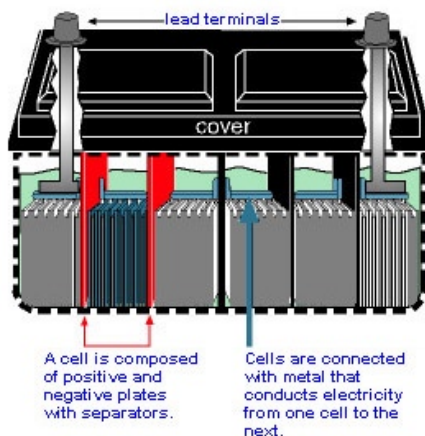
Rechargeable Battery Myths

Can alkaline flashlight cells be recharged? Is there a difference in charging techniques for NiCds and lithium? Do batteries retain "memory," resisting full recharge?

The Basics

A cell is a single, chemical, current-producing unit, typically producing 1-1/2 volts of direct current (DC), like the AA, AAA, and

AAAA cells. Put two or more cells in series to increase the voltage and we have a battery, often 3, 4.5, 6, 9 or 12 volts. But in common parlance, they're all called batteries.



The Myths Memory

Do modern rechargeable batteries develop a "memory" from overcharging, preventing them from being recharged to full capacity?

No. This myth began in the '60s when a satellite locked its solar array on the sun, overcharging its batteries. So unless you happen to have a 1960s battery in orbit, you aren't likely to experience battery memory!

Some battery chemistries, do, however, have temporary "voltage suppression" from overcharging, but one or two discharge/recharge cycles will bring a good battery back to full life.

Rechargeable alkalines

While it's true that primary ("throw-away") cells and batteries, whether alkaline or the old standard zinc/carbon, can be partially recharged, it's temporary and hardly worth the effort; that's why they are called *non-rechargeable*! Even specifically-marked "rechargeable" alkalines have a limited number of cycles (perhaps 50).

Freeze batteries for longer shelf life

Rechargeables self-discharge at a rate of about 1% per day. Low temperatures do slow this down, but by very little. If you have a lot of open, unused refrigerator space, then fine, but storage in a household cabinet will have nearly the same effect.



The same charger can be used for any type of battery

It would seem that if two batteries have the same voltage, then they should receive the same charging technique, right? Wrong.

Different chemistries—NiCd, lithium/sulfur, lithium polymer—have different discharge characteristics and thus require different recharge characteristics to bring them back to full capacity.

Don't let a rechargeable battery get warm or you will destroy it

If it only gets warm, that's fine. It's *hot* we're worried about! If it's warm to the touch and you can hold it comfortably, it's getting charged. If it's untouchably hot, its chemistry is changing to steam and it can explode if it isn't vented!

A discharged battery simply means it has no voltage

No way! If you let a rechargeable battery get to zero, it's time to replace it! Irreversible chemical changes occur that destroy the battery's capacity to hold a charge.

Rechargeable batteries will hold their charge just like alkaline batteries

Uh-uh. Rechargeables self-discharge when not in use, and faster than primary cells and batteries. It's a good idea to periodically check the voltage and make sure it hasn't dropped more than about 20 percent before recharging it. Typically, about once a month for unused batteries should do it, whereas modern primary batteries can be stored for years with only a minimal loss of energy.

Rechargeable battery lifetimes are limited to the number of recharging cycles

While this is true in substance, that number can be well over 1000 for slow, overnight charging. Fast charges reduce the lifetime to more like 800 cycles.

Disposal of all batteries is bad for the environment

That's true for lead, cadmium and other heavy metals found in some batteries, but not for safer, newer chemistries like nickel metal hydride (NiMH).

For more information on batteries, visit this excellent site: <http://www.buchmann.ca/toc.asp>.



Virginia High School Radio Stations More than DJ Training

Story and Photos by Ken Reitz

The radio promos are slick, the music hip, and the on-air sound is tight, but these aren't the sounds of a hot metro radio station. They're coming from WHCE-FM, Highland Springs, Virginia, one of less than two hundred radio stations across the U.S. licensed to high schools.

First on the air in September 1980, WHCE, licensed to Henrico County (VA) Public Schools, has taught hundreds of 11th and 12th graders the ropes of the radio business. Students attending Highland Springs Technical Center (HSTC) are "...lured to the program by the music," says Bob Kaufman, chief instructor for the 32 juniors and seniors in the program, "But they leave here able to write news copy, produce ads and do interviews." They also master the main computer programs in use today by top radio stations nationwide.

Kaufman is short of breath when we meet during his lunch hour, having just returned from his brisk noon walk which he takes to stay in shape physically and help focus his mind. He came to HSTC in 1991 from a broadcast career in nearby Richmond, where he held various positions, including on-air personality at top market rocker XL102. Kaufman has the air of a Dad trying to help kids who may not really appreciate his help. As we tour the school radio facilities he picks up empty fast food wrappers and soft drink cans and tosses them in a nearby trash can. He shakes his head.

Having to adjust to rapid changes in the broadcast industry is just one of the real-world problems this teacher deals with daily. Working within the budget constraints of the county school board, which funds little more than his and a new assistant instructor's salary, Kaufman has to keep his students up to date with new broadcast technology, help them cope with growing into adulthood, all while keeping the 24/7 station functioning to FCC standards.

HSTC students spend half their days at the Center and the other half at their "home" schools, the other high schools around Henrico County. For the most part, HSTC is for students who are not on a college track. Courses taught here include cosmetology, carpentry, and auto body

repair where writing skills are at a scholastic minimum. But Kaufman pushes his students' writing ability. "We write every day," he says, "I'm a firm believer in the idea that you get better by *doing* something than just reading about it." As a result, Kaufman says that 75 to 80% of his students go on to post secondary schools.

"We're not just teaching broadcasting here," he says, "we're also teaching journalism and mass communications." At the end of their second year, when students graduate, they leave HSTC with a portfolio of their best work, including on-air demos of their radio production, writing, and interviewing work.

As with most broadcast stations in the U.S., WHCE is fully automated. The actual programming is run by a computer which takes the music selections, news programs, interviews, and public service announcements (WHCE is non-commercial), all of which are done by the students, and feeds it to the 3,000 watt transmitter in the school's broadcast center. From a small antenna at the sprawling HSTC campus, the signal covers much of the Richmond metro area.

The school's carpentry class was in the

process of building new studios for WHCE and, as a result, part of the facility was a construction zone when I visited. The actual transmitter and computer which controls the on-air programming remained safely behind a locked door in a small, out of the way room.

"Frankly, I'd be just as happy if we didn't even have a transmitter," Kaufman confides. He believes the main purpose of the course is what's happening in the classrooms where students hone their writing, editing, and broadcast skills, rather than what's coming out of the transmitter. And, the on-air presence of this station does seem to be more of an afterthought. While easily sounding like any commercial competitor, WHCE has little connection with the community of Highland Springs, a lower middle class Richmond suburb, directly under the approach to nearby Byrd International Airport.

"We're not well known in the community," Kaufman admits and he hopes that, with the help of his new assistant, who still works weekends at a DC area station, they'll both be able to devote more time integrating the station into the surrounding community.



Chesapeake Center for Science & Technology part of the Chesapeake City (VA) public school system. Elvis was here in 1956, when WFOS-FM was in its first year, during a record promotion tour and they have the photo to prove it!



WFOS-FM main control room can broadcast from any source analog or digital, even 78 rpm discs. The computer screen above the console links the DJ to the station's Scott Automation 18.2 GB hard drive and the 8,000 song library via touch screen.

The WFOS Experience

Virginia's only other full time high school radio station is WFOS-FM, licensed to Chesapeake Public Schools and on the air since 1955. It's located at the Chesapeake Center for Science and Technology (CCST) a few miles from the Chesapeake Bay in the extreme southeast corner of Virginia – a landscape dominated by a flat coastal plain dotted with naval shipyards which loom in the distance a ghostly gray. As with Henrico County, the Chesapeake program is open to all juniors and seniors from the area's six high schools and it vies for students along with similar trade education programs.

In the crowded Tidewater radio market, WFOS' 15,000 watt output has helped garner a loyal following to its eclectic mix of Big Band Swing, Old Time Radio, Oldies, Classical music and nearly everything in between. Its *Blues Traffic Jam*, heard weekdays during the afternoon drive, is especially popular. The broad spectrum of programming is an effort in community outreach according to David Desler, Sr., WFOS Chief Engineer and Radio Broadcast Instructor, who has been with the station for 22 years.

Desler came to CCST from a career as a broadcast engineer. Now nearing retirement age, he projects a grandfatherly persona to his students. "What happened to the pink hair?" he asks a female student coming into the studio for her air shift. "I got tired of it," she replies smiling. He nods without comment.

Desler suffered a major medical problem last year. "The doctors didn't think I'd make it," he chuckles, "I showed 'em!" He sweeps aside his own medical problems the way he sweeps away problems at the station. He never stops moving, never stops working on improving the station, and he sets a great example for his students.

Like his counterpart in Henrico County, Desler has seen the dramatic changes in the radio industry and adapted his program to keep up. He, too, has little to work with in the way of a budget from the school board, which pays the salaries for the three full-time

instructors. He refers to himself as the master of what he calls the "Zero Budget Purchasing System." Over the decades he's built a network of support from the other area broadcasters and civic organizations upon which he's relied for equipment donations. A few years ago, a surplus ambulance from an area rescue squad was given to the school. Desler immediately outfitted the vehicle with donated equipment to do remote broadcasts of area high school athletic events.

The station takes its position in the community seriously. In September 2003, when hurricane Isabel hit the Carolina Coast on its way into Virginia, many Tidewater stations fled the airwaves, but WFOS stayed on the air for the duration of the storm, thanks to its 30 kW propane-fired generator. Desler relayed vital information from the local Emergency Command to area listeners as the storm progressed.

"I'm still getting comments from people who tell me how much they appreciated the station being on the air and having the information they needed," he says.

WFOS, like WHCE, is fully automated,

but the students have less impact on the programming here than at WHCE. There is no journalism component to this program. Still, students learn the fundamentals of broadcasting, using current technology and the latest broadcast computer programs. Many have found jobs in the Tidewater/Richmond region, with a few getting their start in broadcasting outside Virginia.

In addition to WFOS, CCST operates WCTV channel 48, a public broadcast TV station, which is also licensed to the City of Chesapeake. WCTV offers students the opportunity to learn TV production skills. Here, students assist in the production of local public affairs programs and, thanks to a recently outfitted remote truck, do live and recorded sports TV programming from area high schools. Doug Wieboldt, WCTV Engineer, says the entire radio and television broadcast program gives area Juniors and Seniors real-world skills in jobs with a future.

Radio Reality

But, future employment in radio broadcasting in America seems uncertain. The effect of ownership consolidation and total automation of most radio stations have reduced the number of jobs available in most markets. Competition by satellite radio for traditional radio audiences also contributes to this uncertain future.

However, the instructors at both high school stations remain optimistic. Students in Chesapeake will have more job opportunities in the expanding TV broadcast program, and WHCE's Bob Kaufman points to the tangential careers offered by his broadcast journalism program. "Our students are getting jobs in public relations offices, media departments in the corporate world, college sports information offices, even non-governmental organizations," he says. The students' success after graduation depends on the ability of these high school programs to keep up with the direction and pace of the business world.

Meanwhile, the FCC has issued a construction permit, the first step in getting a station on the air, to Shenandoah County Public Schools to



Two of the mobile broadcast vehicles in the WFOS-FM fleet. On the right an ambulance donated from a local rescue squad, on left a microwave point-to-point broadcast truck.

operate low power station WSCE-FM at Central High School in Woodstock, VA. But the typically long wait for such a permit has caused the school system to have second thoughts. Dr. Carol Finn, acting Superintendent for Shenandoah County Public Schools, says the school board has yet to determine whether or not they will proceed with the project. She voiced concerns about several aspects of station's operation and was disappointed that the low power (100 watts) would barely cover the town of Woodstock, let alone the rest of mountainous Shenandoah County.

Shenandoah County won't be the only county in Virginia to give up on high school broadcasting. In 1997, the York County School Board sold its station to a religious broadcast group, known as Creative Educational Media Corp., from Tulsa, OK. The new owners operate the station now, under its original call sign, as a satellite downlink feed of its nationally distributed religious programming.

WVLS-FM, in tiny Monterey, VA, got its start in 1995 at Highland County High School in studios built by the school's carpentry class. The station's call sign WVLS stands for Virginia's Little Switzerland. The county's mountainous terrain makes it the highest county in the state, where the station's 95-ft tall antenna is listed in FCC documents as being 4,350 feet above sea level. It remains the only radio station in the county which also claims to be the least populated county east of the Mississippi and lies entirely within the FCC's declared "National Quiet Zone." Because of its proximity to the National Radio Astronomy Observatory (NRAO) in nearby Green Bank, WV, Highland

County had been prohibited from having any broadcast station until the creation of WVLS. Even so, the FCC required the station to take extraordinary precautions to assure that its signal would not interfere with NRAO.

After 10 years on the air at the high school, the Highland County School Board decided not to renew the lease for the WVLS facilities. Citizens in Monterey were not about to lose their only radio station, so the community took over operation of the public broadcasting station, moving the studios and transmitter in 2005 to the center of town. The station is still on the air today with minimum participation of local high school students and remains the sole source of broadcast information in the county.

High school radio stations across the U.S. are facing similar futures. Budget pressures are forcing school boards to make tough decisions which could cause existing stations to leave the air. Others with hard won construction permits may be forced to give up on their broadcast dreams. School boards with established stations may be tempted to give in to lucrative offers from religious broadcasters or to cash in the value of their license to commercial ventures.

Many high school radio stations – WHCE is one – have benefited over the years from Federal grants known as Perkins Grants (the Carl Perkins Vocational and Technical Education Act). These grants are made specifically to the nation's trade schools and are administered by the individual states. But, Congress has used the Act, since its inception in 1998, as a budget



Dish farm at WFOS-FM with the base of their free standing 172' broadcast tower. Just out of the picture is the 30 kW propane fired generator shed.

whipping boy during its annual funding fracas and the uncertainty of the availability of these funds from year to year creates even more financial pressure on these schools.

More Than a Broadcast Legacy

Back in David Desler's office, I'm getting ready to leave, when we're joined by a well-dressed young man who turns out to be one of Desler's former students. He graduated 10 years earlier from CCST and knocked around the Tidewater/Richmond radio scene for a few years before joining the Navy, where he now pursues a career as an electrician. He had just stopped by to see how his old mentor was recovering from his illness and it was clear that the teacher had earned another life-long friend. The legacy that high school broadcast instructors leave is far more than a fresh crop of workers for the broadcast trade.

Tune In America's High School Radio Stations

Of the less than two hundred American high school radio stations on the air, only a few operate on the AM band, and those are mostly legacy broadcasters from commercial radio's very beginning in the 1920s. The rest are all FM operations and many operate on low power. Few pack the on-air punch of WFOS, Chesapeake, VA, so if you're going to tune them in off air you'll have to be within earshot. But, several stations have launched a presence on the Web and can be heard nationwide even with a dial-up connection. Since most of these stations are funded directly by their respective school boards, you won't usually hear on-air fund raisers. If you do tune in during a fund raiser, consider sending a contribution.

An incomplete, out-of-date and often erroneous list of American high school radio stations can be found at www.en.wikipedia.org/wiki/High_school_radio. Despite its shortcomings, it remains the only such list available. An attempt is made with this list to update the status of each station. Those stations which are no longer operating are listed as defunct. Those stations which are Webcasting will have a hyperlink next to the

listing. A shorter list of unlicensed high school stations transmitting via "Part 15" transmitters, or through local cable TV companies as a subcarrier, or via a closed circuit line are also listed. A list of the six Canadian high school stations which may be of interest to border radio listeners is also found here.

Streaming of high school stations is in a constant state of flux. I found that many more stations are streaming than are indicated on the Wikipedia list. For example, while neither are listed as Webcasters, both WFOS and WHCE have a Web presence. WFOS webcasts 24/7 at: www.cps.k12.va.us/departments/radio. WHCE's site is also up 24/7 known as Mix91. The station's home page is: www.mix91.com/mix.html

To find out if the station you're interested in has an on-line broadcast, just Google the call sign. I found dozens of high school radio stations are streaming using a wide variety of media players. Among the many stations you'll hear are C89 (KNHC-FM) from Nathan Hale High School in Seattle, WA. They even attracted the attention of the national magazines and newspapers. You can find out for yourself here: www.c895worldwide.com.

WFOS-FM tower hosts their main broadcast antenna, point-to-point microwave dish for remote broadcasts and local amateur radio repeater antennas for 2 meters and 70 cm.



Surround Sound

The New Frontier for Digital Radio

By D. Prabakaran

Digital Radio, which comes in several varieties and modes, boasts many new features over its analog predecessor. These include digital audio that is free from multipath and enhanced text displays that scroll song title and artist information. While these are improvements upon analog radio, Europe's attempts with digital radio broadcasts tell us that these features alone might not be enough to sway consumers to trade their existing car stereos for a new digital radio model ... until now. In the age of home theaters in a box, DVD players in cars, and 5.1 surround sound video games and movies, surround sound may be the "killer app" for the digital radio market.

Digital radio has made the incremental step of improving quality by increasing audio bandwidth and adding ancillary services, but this is primarily still focused on delivering two-channel content. To make a significant step, the next generation of digital radio services needs to offer the surround sound experience. Several surround sound radio pilot projects have been completed and the war of standards is raging for a suitable transmission protocol.

"Killer App" for Digital Radio

Stereo digital broadcasting was introduced to Europe a few years ago. Listener response has remained lukewarm. The lesson to be learned is that mere "improved digital sound" is not enough to cause listeners to buy new and more expensive radios. It was the same with the FM mono vs. stereo history: not a lot of FM radios were sold in the USA before stereo broadcasts, even though FM offered much improved fidelity compared to AM. History often repeats with regard to consumer adoption of new technologies.

The technology to transmit 5.1 surround sound over digital radio has just recently been perfected and is now being introduced. Just a few years ago, it seemed we didn't have enough bandwidth even for quality stereo in digital radio. But multichannel audio coding technology has advanced quite amazingly, and surround is a real here-and-now possibility for radio broadcasting.

Multi-channel surround is becoming an increasingly hot consumer desire, mostly driven by the DVD video format, which delivers the experience to consumers at home. Almost all

DVD releases have a 5.1 surround option and many high-end television, home theater, and audio systems are being installed with multi-loudspeaker surround capability. Surround is coming to automobiles as well, with a number of manufacturers already having announced 5.1 car audio systems. DVD Audio and SACD Multi-channel disks offer high-quality surround music to consumers.

The term "surround sound" is not strictly defined. There are several systems available that provide multiple audio channels of information for playback over a system with speakers distributed around a listening sound field. All the surround systems use a low-frequency channel to provide the deep bass of the listening experience. Because of the omnidirectional properties of low frequencies, this deep bass channel feeds a single subwoofer that is usually placed near the front of the sound field. From there, five, six or seven speakers can be placed around the listener to provide the surround soundfield.

The generic term "surround sound" is often used to describe anything with more than two reproduction channels. Most recent progress in this area has taken place in the cinematic and television sound industries, but a growing body of work in pure-audio applications now exists, primarily in the form of commercial music releases, concert recordings and radio drama productions.

With a few exceptions, this content is produced today in a five-channel form, with a configuration intended for reproduction with speakers' placement relative to the primary listening position as left-front (LF), center-front (CF), right-front (RF), left-back (LB) and right-back (RB). Despite this placement description, however, it is conventional to refer to the two back channels in this configuration as left surround (LS) and right surround (RS), while the center-front channel is typically called simply center (C).

A narrowband sixth channel is sometimes added for low frequency effects (LFE), with its content fed to a subwoofer that can be placed anywhere in the listening area. Given that the LFE channel's bandwidth is about 1/10th that of the other five full-range channels, this format has come to be known as 5.1 channel surround. It is the standard format for most multichannel music content produced today.

Different Forms of Multichannel Audio

Three general terms are used to describe the different forms in which multichannel audio may appear in digital radio:

- Discrete multichannel audio – the production format of multichannel content, in which all five (or more) channels are kept wholly separate from one another, and all signals are fed to and from audio devices via isolated audio paths.
- Composite surround format – a system that converges a discrete multichannel audio signal into a smaller number of channels (no less than two), via an encode/decode approach that allows downstream re-extraction of a multichannel signal. This approach allows the storage and transport of surround audio on existing stereo architectures, either analog or digital.
- Component surround format – a digital-only approach wherein audio data and multichannel spatial bit stream data are maintained as separate signals. Downstream processing can apply the spatial data to the audio data to re-extract a multichannel signal. This approach allows the audio data to be managed independently from its spatial reproduction format.

Early Surround

Surround sound is a term that has been thrown around loosely since the appearance of the early multi-channel "Cinerama Sound" format of the 1950s. In current technology, surround sound typically refers to an audio system with a left, center and right speaker in front of the listener and one or more rear speakers behind the listener.

This set-up often is accompanied by a separate subwoofer to handle the thumpy, low-frequency energy. You might start to see how this speaker configuration would lend itself to car audio, with speakers in the front, speakers in the rear and a subwoofer.

In an ideal world, the listener's surround audio source would be able to address each channel of sound discretely, putting separate audio information into each speaker. Until recently, most audio sources were stereo, providing only two channels of discrete sound

information to the listener.

Assuming the listener was in a "perfect" listening environment, "perfectly" centered in front of two matched speakers, sound images could be placed anywhere around that listener by playing with phase relationships between the left and right audio channels. To make the audio appear in front of the listener, the recording engineer would place the audio with equal volume, in phase in both speakers.

To make the audio appear behind the listener, the audio is placed 180 degrees out of phase in one speaker as compared to the other speaker. It created an impressive effect, but listeners rarely found themselves in a perfect listening position, so the multi-directional sound was rarely heard. To overcome this, matrix audio decoders were developed. Matrix audio decoders watch for these phase and intensity differences between stereo inputs and decode them into multiple outputs.

Probably the most recognized example of the matrix decoder was Dolby's surround sound decoder, which appeared in the early 1980s. Suddenly stereo TV and videotapes had a "center" and "rear" audio channel. The major downfall of the matrix audio decoder was that audio appeared in unpredictable areas. For example, imagine a piece of audio with a race car driving in circles around the listener. This probably travels quite nicely around the four speakers, until you add an announcer to the mix. When the announcer starts speaking loudly in the center channel, the listener would also hear the race car quickly bleed to the center channel, because the dominant intensity and phase was the announcer's voice.

This problem compounded itself with more-complex sources such as music; the listener would hear various sounds out of all speakers, but it would not necessarily be an accurate representation of the original source. Another drawback, according to listeners of these decoders, was noise in the surround channels. Often interference from poor reception, misaligned audio, etc. would appear as out-of-phase noise resulting in a loud presence in the surround channels. This problem has only become worse with the invention of compressed audio codecs.

Surround Sound Approaches

There are two general approaches to providing surround sound audio. The multiple channels of audio can be carried through a system as discrete elements. A 5.1 audio system would need six discrete audio paths.

The other approach is to use an encoded signal to carry the surround information. One example of this is matrix encoding, which takes into account the amplitude and phase differences of the various audio channels. The matrix approach reduces the number of discrete paths needed to transmit a signal and has been tried several times in the past with mixed results.

Surround Sound in HD Radio

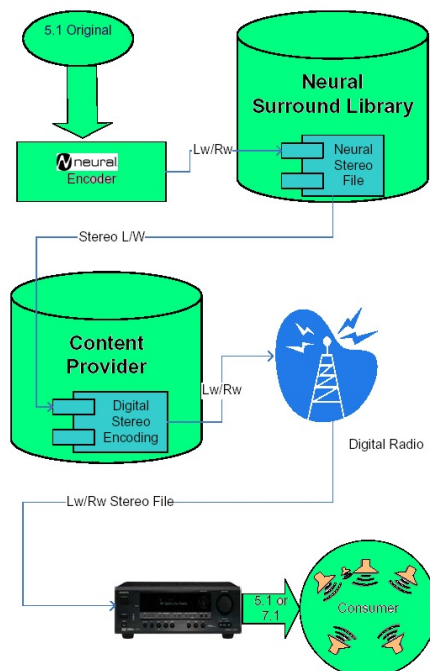
Moving ahead with surround sound technology for HD digital radio: the four companies that are developing systems for

IBOC HD Digital radio are SRS Labs, Neural Audio, Fraunhofer, and Coding Technologies. All four systems are different and accomplish the surround effect in different ways.

Neural Audio Surround Sound

Neural Surround, a breakthrough in audio technology, was developed by Neural Audio in cooperation with leading electronics manufacturers to bring the excitement of surround music to a new listening audience.

Neural Audio has partnered with Harris to produce products based on Neural's technology. The product that applies to surround sound for IBOC is the Harris Neustar 5225 processor. This processor accepts a 5.1 audio stream and creates a stereo signal with a watermark that is used to reconstruct the surround signal when it is decoded.



Neural uses a watermark technology and its 2-D stereo downmix of the original 5.1 material allows seamless and artifact-free cross fades from mono/stereo to surround, surround to mono/stereo, and surround to surround.

Neural's spatial compression and rendering methodology allows the distributor or broadcaster the ability to capture original source 5.1 content and "downmix" it to a 2.0 channel format while allowing the consumer to render the content in any spatial format they choose: mono, stereo, 3 channel stereo, quad, 5.1 or whatever. In the absence of spatial rendering, the content is received and perceived as "stereo" on existing receivers.

5.1 content is downmixed into two fine structures. The 5.1 image envelope is transformed to a two dimensional version of the original 5.1 image envelope. The azimuth of the original image envelope is represented by inter-channel intensity differences. The front-to-back or "depth" of the original image envelope is represented by average inter-channel coherence (normalized crosscorrelation). The 2-D image envelope of the 5.1 content is imbedded in the two downmixed audio

channels in the form of watermarking. Intensity/coherence watermarking is an excellent choice because of its similarity to the image construct of naturally occurring 2-D stereo and compatibility with already prevalent Left/Right content.

Upon decoding, the image envelope of the original 5.1 content is re-synthesized, based on the intensity/coherence information contained in the watermark of the two fine structures. Using this methodology, an impression of the original source 5.1 content is rendered from the two downmixed audio channels with a high degree of merit.

The 5.1 rendering is accomplished by a programmable, transform-based, spatial rendering system. SEE (Spatial Environment Engine) can render any two dimensional audio source (both 5.1 and stereo are 2-D) into as few as two to as many as 256 outputs with a high degree of perceived separation. The spatial elements of 2.0 stereo (or Lt/Rt) are segregated based on the 2-D image envelope naturally residing in the content; nothing is either created or destroyed. "Re-downmixing" of the 5.1 rendering of stereo back to 2.0 stereo (which happens quite often in the HDTV industry) results in "near perfect reconstruction" of the original stereo content with the stereo image completely intact.

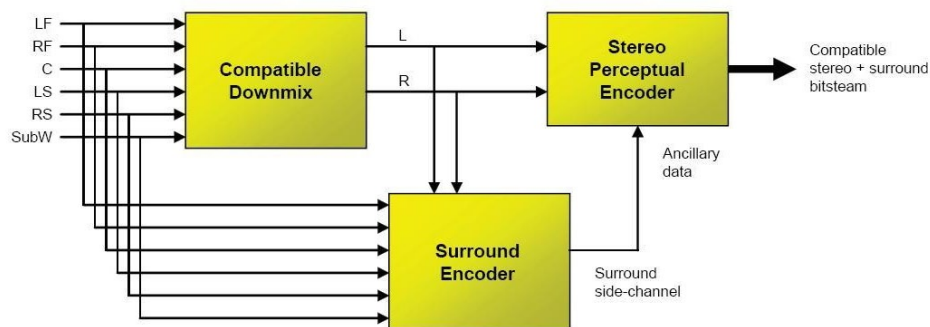
Neural surround technology has been successfully employed on KUVU-FM's live broadcast of three-time Grammy winner Dianne Reeves in September of 2004, HD Radio's first 5.1 live event. In addition, Neural Audio was the first to broadcast 5.1 surround sound using the HD Radio system. Neural Surround capable receivers launched in the US market in spring of '06. With the support of leading broadcasters such as XM Satellite Radio and others, US consumers now can enjoy surround music via analog and digital radio broadcasts.

Fraunhofer Surround Sound

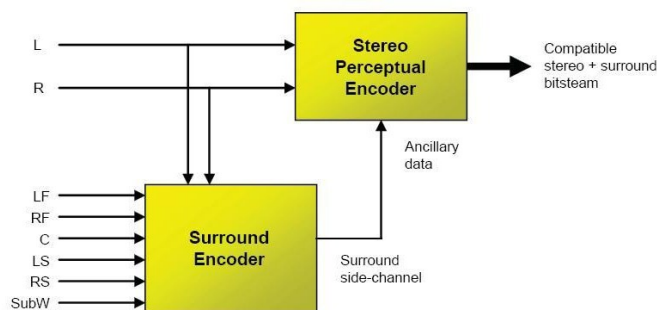
This multi-channel system was invented by Fraunhofer Institute (FhG) and Agere Systems. The Fraunhofer technology differs from the other methods of encoding/decoding surround sound in the way it encodes surround information. Still taking shape, the Fraunhofer/Telos system works with HDC codec of HD radio. This method divides the stream of 96 kbps by devoting 80 kbps of data to the existing stereo signal and 16 kbps to an ancillary data channel.

FhG has been busy pushing the frontiers of audio perceptual research. The latest result is a powerful spatial audio coding system, taking advantage of the most up-to-date knowledge in aural perception. It is accomplished using a technique called coded-discrete which prepares the audio for transmission over HD Radio system.

Psychoacoustics studies prove the level difference, time difference, and coherence between channels creates the perception of spatial image. The key to FhG's multi-channel system is representing these difference values with very compact coding, rather than transmitting all of the individual audio channels. The



FhG Encoder with internal downmix, used when separate surround and stereo inputs are not available



FhG Surround encoder with independent surround and stereo inputs

encoder estimates the values as a function of frequency (that is, within each sub-band) and transmits them to the decoder in an ancillary stream accompanying the main coded audio stream.

The Figures given illustrate how an encoder/decoder pair would work within a broadcast channel in HD Radio. The first step is to create the compatible stereo downmix from the multi-channel material. The resulting stereo signal is coded using any perceptual codec. Since there are no changes to the basic codec, this signal can be received by stereo radios. The spatial encoder extracts the various spatial cue parameters from the multi-channel input, which are transmitted in an ancillary data channel. The decoder, if present in the receiver, recreates the original multi-channel audio.

The FhG system allows a producer to make a manual downmix, thus preserving maximum artistic freedom and allowing maximum flexibility to adapt to different kinds of audio material. Since almost all music released in surround format also has a stereo version on the same disk that could be used as input to the encoder, this stereo version is what would be heard by listeners with non-surround radios – with no modification or compromise of any kind.

Advanced automated downmixing is also an option when manual mixes are not available. A processor could dynamically modify the scaling values and relative phase during mix-down. Such a processor would use advanced algorithms that can take into consideration absolute source positioning, panning laws, the way sources were mixed into the multichannel signals, and original inter-channel phase relationships, so it would have the potential to achieve a quality comparable to manual downmixes. The FhG spatial encoding system is

fully compatible with HD Radio's current codec for the stereo channels. (The side-channel for spatial information is less than 20 kbps, a rate possible in HD Radio's ancillary data channel.)

Because FhG's spatial encoding uses an independent digital side-channel and a modern perceptual approach to spatial cue encoding, it

offers high separation that does not depend on the nature of the audio or that needs to be compromised for stereo compatibility.

Still in its infancy, the Fraunhofer method does not have production models of its encoders or decoders in the marketplace. Fraunhofer says it has products in development, including a 5.1 version of the Omnia processor, that will be available soon. Because this method would require a broadcast facility to store, route, mix, and broadcast discrete 5.1 audio, or carry the ancillary data that is time-aligned beside its stereo audio paths, it would likely require a major overhaul of a facility looking to adopt this method. Stations looking to adopt this method also would need to consider that, since most source material is stereo at present, listeners would only hear sound out of two of their five speakers unless their library was up-mixed prior to broadcast.

HDC Surround sound

Having debuted at the NAB Radio Show 2005, Coding Technologies has entered into the digital radio surround with its HDC Surround Sound Technology. Coding Technologies company is specialized in enhancing perceptual audio encoders with its Spectral Band Replication technology and has developed the AAC Plus and MP3 Pro. Coding Technologies also worked with Ibiquity company to develop the HDC audio codec used in HD Digital Radio. Because this system is based on HDC, the surround system is fully compatible with the existing codec, eliminating the need to add hardware or software elements to decode the surround information.

Any successful surround sound technology for HD Radio needs to have the following features: backward compatibility with existing

radios, compatible with both single-program and multi-program stations, and scalable from "pseudo surround" to true surround, all of which impact on radio stations. It must also be built with industry collaboration. HDC Surround fits all of these requirements.

HDC Surround is the combination of the existing HDC codec and the forthcoming MPEG Parametric Surround. The latter is an enabling technology that allows the encoding of multichannel audio based on the normally coded stereo signal with low additional bit rate. Instead of coding each channel discretely, MPEG Parametric Surround extracts information during encoding on the difference between the stereo mix and the 5.1 channel signal.

This extra information is sent along with the encoded stereo to be interpreted by the decoder. The more bits are allocated to the Parametric Surround, the more accurate is the end result to the original 5.1 mix. This technique reduces the 5.1 channel overhead from 150 percent to 15 percent.

Similar in approach to the Fraunhofer method, HDC Technology uses a stereo downmix to provide compatibility with stereo receivers and adds a data stream that contains the information needed to create the surround channels when the decoder is present. The main difference is that while Fraunhofer locks the rate of the stereo and surround streams, Coding Technologies allows the streams to be dynamic in their bit allocation without exceeding the 96kb/s limit. This allows for greater flexibility in the datastream application. Also, HDC surround can be deployed within a modern digital radio station without a complete overhaul of the existing stereo infrastructure.

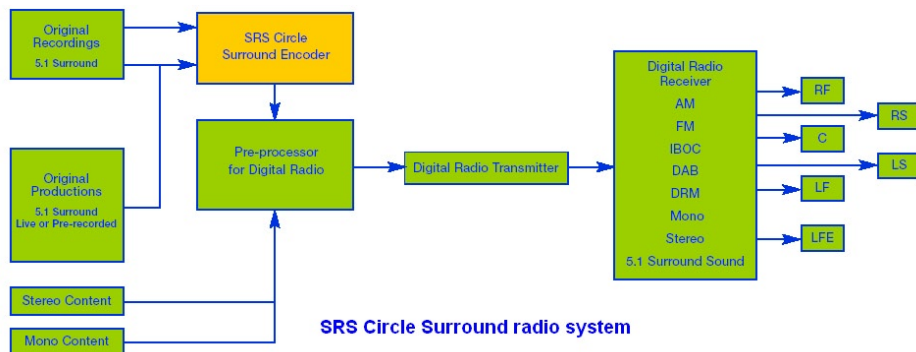
The surround information in HDC Surround can be scaled up as high as 24 kbps or as low as 1kbps. This low-bit-rate capability means that stations today can start with full surround on a single program and retain the pseudo-surround effects similar to the other solutions if they move to multiple program broadcasts.

Due to the stereo-mixdown nature of HDC Surround, stations can be HDC Surround-enabled through additions to the existing stereo chain, instead of requiring replacement of the entire system.

SRS Circle Surround

SRS Lab has developed a technology called Circle Surround, which can encode 6.1 channels of discrete audio for distribution over two-channel carriers. Circle Surround encoding is compatible with mono and stereo playback. This represents a substantial improvement over previous Lt/Rt based encoding systems, which are not as well suited to handle modern, multichannel media with more than four channels of audio. This means radio can deliver playback and broadcast in surround sound through existing stereo infrastructures. Circle Surround encoding is also backward compatible with mono, stereo and all matrix decoders.

Circle Surround is similar to the Dolby Surround encoding/Dolby Pro Logic decoding process that was prevalent in the 1980s and 1990s, before the advent of 5.1-channel



discrete digital systems such as Dolby Digital and DTS. To broadcast in Circle Surround, a station routes up to 6.1 channels of sound into a Circle Surround encoder, from which two channels of sound emerge and are then broadcast through HD Radio.

Circle Surround is a matrix encoder, using a summing and difference network to downmix the surround signal into a stereo format, which includes a bias signal that is used to reconstruct the surround information when decoded. Additional stereo information can also be added to the encoded stream. Circle Surround encoding can be distributed via a bit-rate as low as 48kb/s; however, 128kb/s will provide maximum separation. At 64kb/s, a station could transmit a surround signal with some separation in the main signal.

Advanced matrix systems like SRS Labs' Circle Surround significantly improve decode performance over older systems by using multi-band and variable time-constant steering

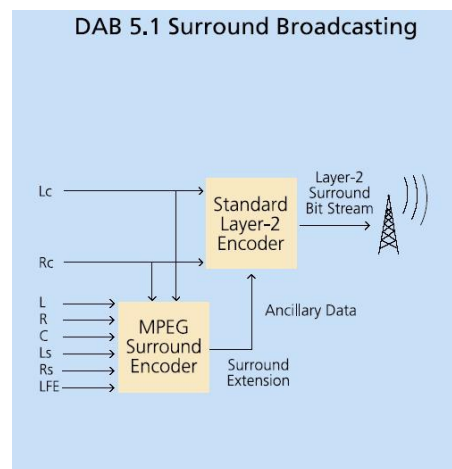
to stabilize the sound field. With systems of this type, full 5.1 or even 6.1 encode/decode capability is supported, while stereo and mono compatibility as well as functional cross capability between matrix encode/decode systems is retained.

On playback, the decoder detects the surround-encoded information in the stereo signal by analyzing the ratio between correlated information and anti-phasic surround material inserted by the encoder. This ratio is generally much higher in an encoded stereo signal than in a nonencoded signal.

Implementation of the Circle Surround encoding solution for the HD Radio platform allows radio stations to encode any multichannel content into two-channel output for broadcast over the HD Radio system, which can then be decoded into full-bandwidth surround sound with any decoder found in millions of home theater and automotive systems.

Surround Sound for EUREKA 147 DAB

DAB Surround is a new surround sound technology developed by Fraunhofer Institute for EUREKA 147 DAB. DAB Surround is fully backward compatible to all the DAB receivers already in the market. DAB Surround combines the existing MPEG Layer-2 audio codec with MPEG Surround. This brings 5.1 Surround Sound to Digital Audio Broadcasting EUREKA 147 DAB still including the full range of Programme Associated Data (PAD) services. MPEG Surround is a generic surround extension, which can be associated with almost any perceptual audio codec, while remaining fully backward compatible to stereo or even mono.



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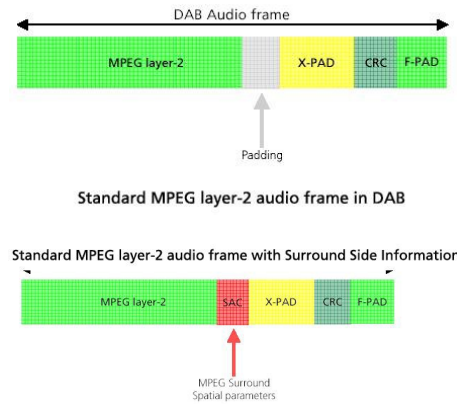
MPEG Surround is a compromise between the discrete and the matrix methods. It provides the accuracy of discrete encoding while preserving the stereo compatibility and bandwidth efficiency of the matrix encoding. The transmission channel requirements for an MPEG Surround coded signal remain similar to those required for conventional stereo, and the existing stereo transmission infrastructure can stay in use. At the highest level, MPEG Surround adds digital information to a stereo mix, enabling reconstruction of an original 5.1 surround audio with little bandwidth overhead.

The nature of the MPEG Surround technology allows it to scale in quality proportional to the amount of bandwidth allocated to the surround signal. "Quality" in this case is measured by the ability of the encoded signal to accurately reproduce the original 5.1 channel audio signal sent into the encoder. While the nominal operating bit rate for MPEG Surround on HD Radio would be around 6kb/s, MPEG Surround can scale all the way up to full transparency.

Key Features of MPEG Surround

- Very low bitrate representation of high-quality multi-channel signals
- Full backward compatibility to mono or stereo
- Surround enhancement data rate scalable from 3 kbit/s up to 32 kbit/s

A multi-program Digital Radio station would likely allocate 64kb/s out of the total 96kb/s to the main stereo program, then add 6kb/s MPEG Surround to achieve a full 5.1 surround sound broadcast. By tuning the encoder even further, the stereo bit-rate could even be pulled back a bit, thereby reducing the surround sound overhead to be almost negligible. MPEG Surround provides surround sound to a stereo broadcast with room for extra audio programs or other digital broadcast services. The achieved audio quality is very close to



a fully discrete surround system, despite the fact that the surround image is represented by a very low additional bit rate down to 5 kbit/s. Currently, the Moving Pictures Expert Group (MPEG) standardizes MPEG Surround as an ISO standard.

Thus, MPEG Surround guarantees a smooth, compatible, and cost-effective introduction of multi-channel sound to DAB: To upgrade to surround sound broadcasting, stations may just use a DAB Surround encoder instead of the conventional MPEG Layer-2 Stereo encoder.

On the receiver side, a conventional DAB receiver would simply ignore the surround information and play high quality stereo, whereas DAB Surround receivers reproduce the full multi-channel sound.

For DAB Surround transmission, Fraunhofer Institute for Integrated Circuits IIS offers a DAB Surround encoder. For playback on the receiver side, a PC-based solution is available as a WinAmp Plug-in. For surround sound on portable DAB devices, Ensonido is the ideal supplement. This recent development of Fraunhofer IIS enables playback of surround sound on common stereo headphones. That

way, listeners can just plug in their headphones to the DAB Surround receiver and enjoy full 5.1 surround sound.

Challenges Ahead

Dolby Labs and SRS Labs both have established bases of existing surround sound playback systems in the marketplace that decode their modified matrix formats. Fraunhofer/Telos and Coding Technologies/Orban are proposing new high-performing parametric discrete systems. Neural Audio appears to have the most easily manipulated and transmitted discrete method using their watermark technique.

With four companies developing potential systems, there could be a conflict in deploying them in consumer devices. Stations can only implement one system for transmission. If all four prove to be viable, it is possible that consumer receivers will only be able to decode one or two of the formats. One possible solution to this problem would be a software-defined receiver that would automatically sense and decode the proper system. For broadcasters, backward compatibility is ideal for existing facilities with a stereo infrastructure, because tripling the audio channel capability for discrete 5.1 is not an easy task.

The potential challenge ahead is all about standards. Without a clear industry-wide technical standard, stations are not compelled to implement the necessary production and transmission infrastructure to deliver 5.1 surround sound. Unless radio stations encode and receivers decode the same 5.1 format, nobody will hear it.

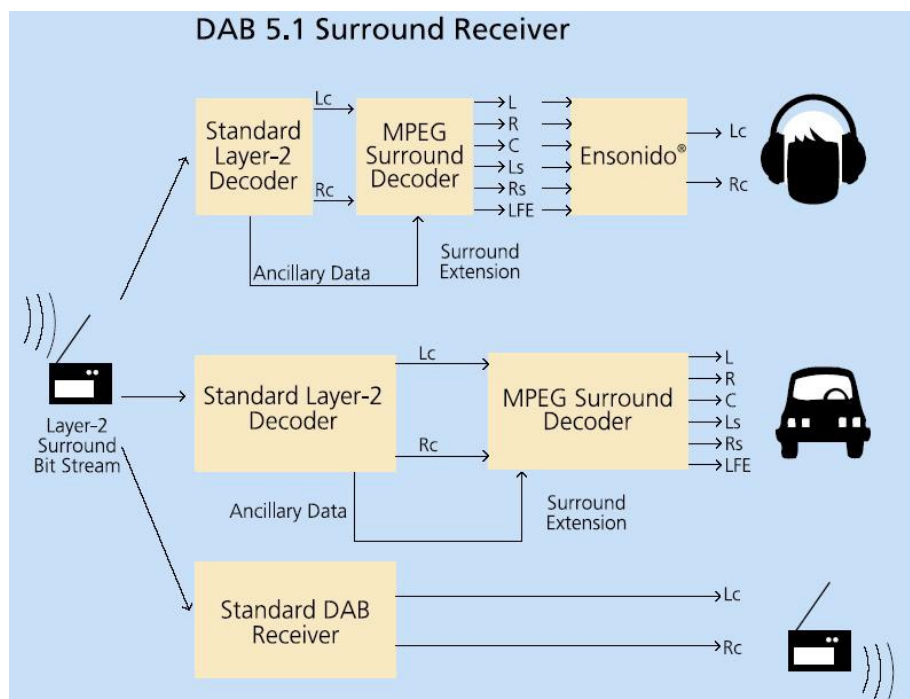
The other challenge is related to multicasting, which refers to the broadcasting of multiple audio programs within a single IBOC service. The HD radio system accommodates multicasting programs in two ways, utilizing either the Supplemental Program Service (SPS) or Advanced Application Services (AAS) features of the system. The reduction in audio program bit rate required for IBOC multicasting has more subjective impact on a surround audio signal than on a stereo or mono signal. This impact may also vary with the surround encoding format used.

Conclusion

Surround sound radio is new technology which has just been standardized, and it will require time to be integrated into production and transmission equipment and decoder chips.

Surround has many benefits, but it has to fit within the many restrictions imposed by the digital radio system, existing broadcast plants, and the new service offerings being planned. Still, the future looks promising for surround sound multichannel music: Both digital radio technology and subscription satellite radio services look like potential sources for surround sound music. Since automobiles are leading the market for these two digital services, the future is moving towards surround sound in your car – maybe sooner than you think!

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New Year's Resolution: Use Less Power

The above title may be misleading. I'm not just talking about ham radio power output. I'm talking about whole-house power consumption. In 2005 oil was selling for an average of \$38/barrel. In 2007, the average was over \$70/barrel. No amount of wishful thinking will get us back to under \$40/barrel. Those days are gone. Each year your electric, gasoline and natural/LP gas bill will increase by substantial amounts. And, whether or not you believe in global warming, your CO₂ output will grow with it. But, it's not all bad news. I'm going to show you how to save enough money on this year's electric bill to buy your next radio.

❖ Beware the Phantom

The most obvious sources of power consumption in your home are your heating/air conditioning system, water heater, and cooking range. As you look around your shack and

entertainment center, you can see which items are likely power drains. But, there's a lot of power consumption that goes unnoticed. This is called *phantom* power. Here are a couple of quick examples of phantom power: Some gas ranges use a "glow bar" to ignite the burners when they're turned on. But some glow bars can continue to consume 500 watts even once the gas is lit. It's better to use electronic spark ignition. Similarly, some gas furnaces have a pilot light that stays lit 24/7 year round. Again, electronic spark ignition is the answer.

I had always heard that many electronic devices such as TV sets, satellite receivers, etc. also had a substantial phantom load when supposedly off. I wondered just how much power was being used so I bought a product made by P3 International called the Kill A Watt® (model P4400) from C. Crane* for \$44.95. It's a device that plugs into any wall socket and into which you can plug the electronic gear to be measured. The model P4400 can show voltage, the amount of amperage drawn, watts being used and, if you leave the unit plugged in, will show the cumulative kilowatt hours.

❖ Finding the Culprits

As I wandered around the house plugging in various devices I took copious notes on my findings. I was amazed by how much some devices were consuming even in standby mode, while others amazed me at how little they consumed.

I went first, naturally, to my shack and checked out the gear there. The Astron RS-12A power supply which I use to power my 10 meter beacon 24/7 used 8 watts with no load, 16 watts with the HR2510 transceiver on but not transmitting, and 22 watts transmitting 10 watts output in beacon mode. My Astron RS20A power supply, which I use to power my TS-140S transceiver, uses 22 watts with no load and 250 watts key-down in CW mode running 50 watts output. One surprise was the old Uniden 2021 portable shortwave radio which uses 4 watts when turned on and 3 watts off. A weather radio uses 1 watt standby and 2 watts on.

Two things to think about when leaving electronic devices unplugged for any length of time: You will not damage the circuitry of solid state equipment. I've had many radios sitting in closets for years that worked perfectly the next time I fired them up. On the other hand, some

devices have built-in lithium batteries which are used to store user-defined settings. These batteries could be tapped out after months of unplugging the device for 6 hours or more per day. Further, some of these devices may have to be sent back to the factory to have such batteries replaced. Examine your owner's manual before setting out on such a power conservation course.

I have a fairly old IBM NetVista computer which gets its power from an uninterruptible power supply, which when turned on uses 4 watts. Turning the computer on sees the power surge to 150 watts and settling back to 72 watts. After leaving the computer on long enough to induce "sleep" mode, power consumption dropped to 4 watts or about the same as a standard night light. I had expected it would be greater. The ink-jet printer consumes 3 watts when on standby.

The entertainment center proved to be a major power drain, but there were a few surprises. The four-year-old projection TV surges to 320 watts when first turned on and settles down to 250 watts running constantly. But, when it's in standby it takes only 7 watts. The biggest power hogs were the satellite receivers. When the Globecast MPEGII FTA (free to air) satellite receiver is on, it draws 29 watts. When it's off it still consumes 27 watts. The Motorola 4DTV satellite receiver draws 58 watts on and 56 watts when it's off. When it's powering the drive motor for the 10-ft. dish, it surges to 150 watts, settling to 100 watts until the dish stops. The most efficient of the MPEGII FTA receivers proved to be the ST9900 receiver (8 watts), Coship receiver (8 watts) and the Fortec receiver (11 watts).



P3 International's Kill A Watt shows you where the power's going and costs \$44.95 from C. Crane. (Courtesy: C. Crane)



In the audio department I found that my ten year-old Kenwood stereo uses only 1 watt in standby, but 37 watts turned on. An 8-inch powered sub-wwoofer draws 6 watts continuously, while the XM SkyFi draws 1 watt standby and 5 watts on. The little FM whole-house transmitter uses 2 watts 24/7. I found that a TV antenna pre-amp draws 3 watts continuous power.

Small things throughout the house were interesting to monitor: an electric lamp timer uses 2 watts 24/7. A cell phone charger uses 4 watts when charging and 1 watt when just plugged in. Similarly a cordless phone charger uses 4 watts charging and 2 watts standby.

❖ Adding up the Expenses

P3 International makes a more expensive model, the Kill A Watt EZ (\$69.99), which is capable of calculating the amount of money any given device is costing per hour to operate. You can save the extra bucks and do the



Kill A Watt EZ lets you program your power company's rates to easily calculate the cost of operating devices around your home and sells for \$69.95 from C. Crane. (Courtesy: C. Crane)

calculations yourself with the P4400. If your power company provides the information on your bill, it's easy to calculate. You can also compare what you did last year and see month-by-month how you're doing this year. The very least you'll be able to do is knock 10% off your energy costs by simply paying attention to what electronic devices don't need to be on. But, if you're willing to tweak your power consumption a little more, you may be surprised at the results.

One of the most cost effective things you can do to reduce your monthly energy bill is to replace your incandescent light bulbs with compact fluorescent lights (CFLs). This is especially true in winter when house lights are on more hours per day. Here's the tip-off: if it produces heat, it's an inefficient light bulb. Put your hand near a regular 60 watt bulb and it's hot. Put your hand near a CFL bulb of the same light output and you can't tell it's on. The heat generated is wasted electricity. It's just like the old days of vacuum tube radios. They were like little space heaters. But, modern solid state radios can be on for years and not put out any appreciable heat. That's efficient use of power.

But, there are a few problems with CFL bulbs. You can't use them in dimmer lamps. They do produce a loud buzz in an AM radio placed near a lamp with such a bulb. But, beyond 3-5 feet the buzz is not detectible. If you're using an outdoor antenna, the bulbs will have no effect. There's no effect on the FM band, and the higher you go in the shortwave bands the less effect there is.

At present CFL bulbs tend to be more



Phillips compact fluorescent (CFL) light bulbs last many times longer than incandescent bulbs and use a fraction of the power. These 13 watt bulbs replace 60 watt incandescent bulbs and cost \$11.95 for a set of three from C. Crane. (Courtesy: C. Crane)

expensive than incandescent, so your initial outlay of capital is greater. But, they can last many times longer, so, by using less power and lasting much longer they'll easily pay for themselves in the long run. I believe the cost will come down dramatically as CFLs gain wider market share.

Another problem with CFL bulbs is the glare. But, that's usually a sign that you're using too big a bulb. If you're replacing a 100 watt incandescent bulb, do so with a 17 watt CFL; a 60 watt bulb with a 13 watt CFL or less. Do some experiments, but only replace incandescent bulbs that will be on for more than 20 minutes. For example, there's no need to replace incandescent bulbs in closets that are only briefly turned on.

There's one final problem with CFLs and that's bulb disposal. These bulbs contain a small amount of Mercury. If you drop a bulb on the floor and it breaks, there's more than glass to clean up. Disposal of used bulbs is also a concern. But, the EPA has a bulletin about CFLs which I urge consumers to read. You can find it at www.energystar.gov. Click on: FAQ "Information on Compact Fluorescent Light



Bulbs (CFLs) and Mercury." This bulletin was released in August 2007.

There's no point in waiting to save money on your electric bill. Energy prices are not going to drop. Start this month by replacing your incandescent bulbs, pulling the plug on electronic devices not needed, lowering your furnace thermostat, and in the summer set your AC thermostat a little higher. I started doing this last summer when I decided to do something about my increasingly high electric bill. As an experiment for the duration of July I ran the AC only 6 hours/day and turned off all the electronics for 6 hours/day. I discontinued operation of my 10 meter beacon (my next project is to convert it completely to solar power). The bill dropped more than \$100 compared to the previous July. And now, for the first time in many years, my bill is going down each month.

As you can imagine, the cumulative effect of everyone in the country doing similar things to reduce electric consumption means fewer new, coal-fired power plants coming on-line, less raw energy (coal, LP or natural gas) consumed, lower carbon emissions and cheaper residential electric bills. That may be bad news for power company executives and stockholders, but when was the last time they did you a favor?

Manage the power in your shack, in your home, in your life, save money and, OK, save the planet, too.

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Q. Does the federal government have the capability to monitor all cell phone conversations, analog and digital? (George Cassidy, email)

A. Certain agencies have that capability, although some digital systems are more difficult to decode than others, and some systems require the cooperation of the carrier service. Naturally, there aren't enough agents to listen to all the cell calls in real time, but suspicious circuits can be recorded and selectively monitored later.

Portions of the radio spectrum can be recorded and "received" (monitored) later on conventional radio receivers; this is called pre-detection recording. During the days of tape recording, the National Security Agency (NSA) was reputedly the world's largest consumer of recording tape – perhaps they are now the largest consumer of hard drives!

Q. I have a modest collection of Zenith tube radios dating from the late 1930s. I'd like to DX on the shortwave bands and would appreciate some ideas on antennas (both active and passive) that would be appropriate for radios of this vintage. (Eric Beheim, Descanso, CA)

A. Vacuum tube radios of that era had plenty of amplification, but they also generated a great deal of internal (thermal) noise; additionally, their components were not efficient at the higher radio frequencies. For those reasons, large antennas were necessary to hear weak shortwave stations. Random length antennas 50-150 feet in length were the order of the day. Nowadays, an active antenna like the H800 Skymatch would work as well.

Keep in mind, however, that bypass and coupling capacitors often become electrically "leaky" with age, further degrading reception, and, these days, shortwave stations are more numerous, often congesting the radio spectrum and causing mutual interference that can't be separated by the poor selectivity of the old timers.

Q. Mounted in my ground-floor window I have a 5-ft broomstick antenna tightly wound with wire connected to my portable shortwave radio, but I can't hear WWV during daylight hours. Is this a function of the sunspot cycle? (Unsigned email)

A. Assuming the receiver is working properly,

it depends on which WWV frequency you are trying to hear, where you are located, time of day, and location of your antenna. But there is one more variable that you haven't accounted for: The broomstick antenna.

Although you have lots of wire on it, the length of the antenna is only 5 feet, because that's what the wire is compressed to, so it's really no better than the original whip, plus it might not be the correct impedance match. Your signal will be much stronger if you stretched the coil of wire out to a tree.

Q. Can the Grove Scanner Beam Antenna be used for transmitting on marine VHF frequencies? (Chuck Fesperman, KS4XU)

A. Yes, it can, and for the 144-174 MHz ham/high band commercial/government bands and 406-512 MHz UHF as well. The limiting factor is the power which the balun transformer, a standard TV-style unit, will allow. We've had no problems up to about 25 watts or so.

Q. Haven't aeronautical digital links like HFDL and ACARS either gone to encryption or to satellite? (J.J.O., NC)

A. Quite the opposite. They are actually expanding in use and both systems use open architecture, so they can be easily monitored by readily-available digital demodulators and software decoders.

Q. Why do some receiver manufacturers offer identical-bandwidth filters at different IF frequencies? For example, the IC-R75 has options for a 500 Hz CW filter in the 9 MHz and 455 kHz IF. Is one better than the other, or should I get both? (Robert Morris, Cambridge, MA)

A. Receivers convert the original signal frequency downward in two or three steps (intermediate frequencies) to isolate it. Narrow bandpass filters can be designed for any IF, but the lower the frequency, the less complicated and less expensive the filter.

Filtering at a higher IF reduces images (false replicates of the signal on erroneous frequencies) caused by conversion(s), and improves dynamic range (interference-free reception in spite of the presence of overly-strong, off-frequency signals).

With the highest-quality (read: expensive)

receivers, dynamic range and images are not a problem, so only the low-IF filters need to be selected. For the sharp CW mode, the R-75 can benefit from both filters, but mostly from the low-IF filter.

Q. Do electrical utility companies still use power lines to intercommunicate with data and voice? (J.J.O., NC)

A. No voice any longer, just data for purposes like remote control and meter readings. Line load telemetry is found nationally on 154.465 MHz; set your scanner on that frequency and every few seconds you should hear a data stream near you!

Q. I have been having considerable difficulty receiving shortwave broadcasters which I used to hear very clearly. Lately I've heard ham radio operators discussing poor shortwave propagation, and I know about the 11 year sunspot cycle; is this the reason for the poor reception? Do some frequencies come in better than others? (Ian Moir, Chile)

A. The sun exhibits an 11 year (average) cycle for its prominence of sunspots. At the sunspot maximum, the solar x-radiation reaches the earth's outer atmosphere, the electrically-charged (ionized) ionosphere, increasing its electrical density. When the earth-bound shortwave radio waves reach that level of the ionosphere, the higher the frequency, the more likely they will refract (bend) back, skipping over a considerable distance.

10 MHz is arbitrary, but it is commonly used to separate the daytime/nighttime, long-distance shortwave propagation. Above 10 MHz is primarily a daytime band, and below is primarily nighttime.

We have passed the sunspot minimum for this cycle and activity is gradually – albeit erratically – building up, but it's nowhere near what it will be in about 4 years.

As I type this at 4:30 p.m., I'm getting absolutely no signals whatsoever in the 21 MHz range, but down at 15 MHz I'm hearing quite a few international broadcasters. As I go lower, 9 and 11 MHz are booming with activity, but the 7 MHz and lower ranges are pretty quiet.

Tonight I'll expect to see activity above 13 MHz just about disappear, but lower, in the 4-9 MHz range, signals should be quite strong.

Questions or tips sent to Ask Bob, c/o MT are printed in this column as space permits. Mail your questions along with a self-addressed stamped envelope in care of MT, or e-mail to bobgrove@monitoringtimes.com. (Please include your name and address.)

Welcome to the first *MT Help Desk* of the New Year. With the dawning of this New Year there are some major changes in the government and military frequency spectrum you need to be aware of. This month we will cover all of these changes that will have a major impact on your scanner frequency list.

Q. *I have seen several references, including posts that you have made on various newsgroups, that indicate that the US Government is putting new bandplans in place for the various government land mobile bands in the VHF and UHF spectrum. Where do we stand on all this at present and where should I be listening now for federal government communications? (Joseph Clement-California via email)*

A. What most radio hobbyists do not realize is that the US Government has been rebanding their frequencies to the newer narrowband technologies for some time now. I first documented these changes several years ago in *MT's Fed Files* column. In case you weren't around then, let me bring you up to speed on what has been and is currently going on.

First, let's take a look at the VHF radio spectrum. There are several subbands the government uses in the 30-50 MHz VHF low band range. According to the official bandplan published in NTIA (National Telecommunications and Information Administration) documents, the spacing in this Land Mobile Radio band has always been 20 kHz (with a signal specified to occupy 16 kHz or less bandwidth). However, it is interesting that we have been seeing quite a few signals with 25 kHz spacing being used within the DoD subbands listed below.

VHF Low Band Subbands

29.900 - 30.550 MHz

Military LMR. Used by the military services for tactical and training operations to include tactical air-ground and air-air communications.
Non-Military LMR. Other Federal agencies use this band for natural resource management and for wildlife telemetry.

32.010 - 32.990 MHz

Military LMR. This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications.
Non-Military LMR. Other uses include land management and protection of natural resources.

34.010 - 34.990 MHz

Military LMR. (See 32.010-32.990 MHz)
Non-Military LMR. Extensive use of frequencies in this band is for natural resource manage-

ment, park security law enforcement at national parks, forests, wildlife refuge areas, etc. Some other uses of this are for law enforcement and facilities security management.

36.010 - 36.990 MHz

Military LMR. (See 32.010-32.990 MHz)
Non-Military LMR. Other uses include national park management, law enforcement, public safety nets, contingencies, and natural resources management.

38.270 - 38.990 MHz

Military LMR. (See 32.010-32.990 MHz)
Non-Military LMR. This band is extensively used for LMR communications in the operation, protection, and maintenance of national parks, forests, wildlife refuge areas, etc. Frequencies in this band are also used for reservation programs, law enforcement, public safety operations, control of power generation transmission and water facilities, environmental data collection, fish management, and wildlife telemetry programs.

40.010 - 41.990 MHz

Military LMR. (See 32.010-32.990 MHz)
Non-Military LMR. This band is extensively used for LMR communications in the operation, protection, and maintenance of national parks, forests, wildlife refuge areas, etc. Frequencies in this band are also used for meteor-burst communications, reservation programs, public safety operations, environmental data collection, fish management, and wildlife telemetry programs.

46.610 - 46.990 MHz

Military LMR. (See 32.010-32.990 MHz)
Non-Military LMR. Extensive use of this band is for contingency response to various national disasters. Other uses are for national resources management, law enforcement, tornado tracking, and various meteorological research support.

49.610 - 49.990 MHz

Military LMR. (See 32.010-32.990 MHz)
Non-Military LMR. This band is used extensively to support contingencies or natural ecological emergencies, some public safety requirements, MARS system, and air-quality measurements.

138 - 144 / 148 - 150.8 MHz

The US military is currently overhauling the 138-144 MHz and 148-150.8 MHz LMR bands. These bands are being completely shuffled from what we have seen in past years and frequencies will now be spaced 12.5 kHz apart. Together, these two subbands are one of the Department of Defense primary military tactical and training bands for fixed, mobile, and aeronautical mobile communications. These bands are also used by the Army, Navy, Air Force, U.S. Marines, and the U.S. Coast Guard for non-tactical land mobile radio networks that support military infrastructure functions (i.e., fire crash, security, ambulance, fuels, disaster preparedness, commanders net, transportation, etc.) at and in the vicinity of military bases and numerous military training areas and national test ranges. They are also essential to the activities of the Air Force Auxiliary (Civil Air Patrol) and USCG Auxiliary for support of search and rescue operations. Civil emergency communications

and the Military Affiliate Radio System (MARS) are also supported in this spectrum. Finally, the US Coast Guard also operates auxiliary nets for boating safety here.

VHF High Band

In recent years, radio hobbyists have seen major changes in the federal government VHF LMR high band (162-174 MHz). The channel spacing of 12.5 kHz was mandated for all agencies after January 1, 2005. This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.

UHF Land Mobile Sub-bands

The last band to make the changeover to the new 12.5 kHz narrowband channeling is 406.1-420 MHz UHF Federal LMR band. This band is primarily used by federal agencies for non-tactical land mobile radio networks that maintain and support their agency infrastructure functions at and in the vicinity of their stations and at ancillary locations. This band also supports federal government trunked radio systems.

At midnight on January 1, 2008, it is mandatory that all agencies have switched to the new narrowband frequencies in the plan listed below. This government frequency re-allotment provides channel restructuring for use in two frequency simplex systems and in multichannel trunked systems. This will provide increased spectrum efficiency. Here is the new breakdown.

406.1125 MHz (Channel 1) to 410.9875 MHz (Channel 391) at 12.5 kHz spacing. These frequencies will be used for land station transmissions (or mobile receive). The frequencies above are paired with 415.1125 MHz (Channel 1) to 419.9875 MHz (Channel 391) which will be used for land station receive (or mobile transmit). These frequency pairs are to be used primarily for two-frequency simplex operations, conventional repeater pairs, and in multi-channel trunk radio systems.

411.0000 MHz (Channel 392) to 415.1000 MHz (Channel 720) at 12.5 kHz spacing. The remaining frequencies in this spectrum are allocated for single frequency (simplex) operations.

So, if you are interested in federal LMR communications, it is time to start exploring these "new" federal bands. Here is a piece of radio hobby wisdom that will help you regain your radio scanning mojo so you can find all of these new active frequencies in the federal radio spectrum: *"A radio search button should never gather dust – it should have the lettering worn off!"*

Resolve to Scan Something New

Happy New Year!

As we head into 2008, I'd love to hear from folks who are scanning something *other* than public safety radio systems. Although most scanner owners are interested in hearing the day-to-day activity of their local police and fire departments, there is a lot more on the airwaves to monitor. If you have a favorite service or organization you monitor that is not part of public safety, please send me an e-mail or mail a letter with the details. Make a resolution this year to monitor something new!

This month we'll answer some mailbox questions, describe some resources for scanner control software, and keep you informed about upcoming changes to a large metropolitan radio system.

❖ Rushville, Illinois

Hi Dan,

I'm from Rushville, Illinois, which is in west-central Illinois. I was wondering how can I get trunking frequencies; for instance, the Illinois State Police District 20 that covers Schuyler county and other counties? I have a Radio Shack Pro-97 1000-channel triple trunking scanner that has the trunking on it that I don't know to get.

William in Rushville

Rushville is a town of about 3,200 people located in Schuyler County, which itself has about 7,100 residents. It is located about 200 miles southwest of Chicago and about 100 miles north of Saint Louis, placing it in the nation's Corn Belt. The county has been slowly losing population over the past century, having had more than 16,000 residents in 1900.



As you might expect, the 440 square miles of the county is largely rural. The majority of public safety radio traffic currently takes place in the VHF band, much of it centered around the county seat of Rushville.

Frequency Description

151.0250	County Highway Department
151.8350	County School Buses
154.4150	County Fire (Dispatch)
155.0700	Sheriff (Dispatch)
155.2800	County Rescue Dispatch and Operations
155.8200	County Emergency Services and Disaster Agency
159.0300	Sheriff (Mobile Extenders)
453.0375	Sheriff (Mobiles)
462.9500	Emergency Medical Services

You may also hear some activity on the old VHF low band frequencies, still assigned to the county:

Frequency Description

39.46	Old Point-to-Point
39.50	Old County Sheriff's Net
47.58	County School Buses

The county is also licensed to use some statewide VHF frequencies, for those times when they need outside assistance.

Frequency Description

154.2650	Interagency Fire Emergency Radio Network (IFERN)
155.0550	Illinois Radio Emergency Assistance Channel (IREACH)
155.3400	Medical Emergency Radio Communications for Illinois (MERCI)
155.4750	Illinois State Police Emergency Radio Network (ISPERN)

IFERN (Interagency Fire Emergency Radio Network) is typically used for mutual aid activities, when a fire department requires assistance from other agencies. Due to heavy use of the primary IFERN channel, an additional frequency of 154.3025 MHz is used in Illinois and Wisconsin as an alternate. Activity here may include disaster response coordination and information dissemination to participating agencies.

IREACH (Illinois Radio Emergency Assistance Channel) is a frequency set aside for local governments and public safety agencies to communicate with other agencies when there are no other direct means are available. This channel is typically used for on-site, mobile-to-mobile communication, but base stations may also be



licensed to use this frequency.

MERCI (Medical Emergency Radio Communications for Illinois) is a statewide emergency medical service frequency used for communication between hospitals and ambulance crews.

ISPERN (Illinois State Police Emergency Radio Network) is a statewide mutual aid channel for law enforcement agencies. It is supposed to be used for pursuits, alerts, and immediate inter-agency communication, although you may hear some non-emergency activity as well.

The city of Rushville has additional frequencies worth checking:

Frequency Description

155.7750	Rushville City Operations
460.1750	Rushville Police (Dispatch)

❖ Illinois StarCom21

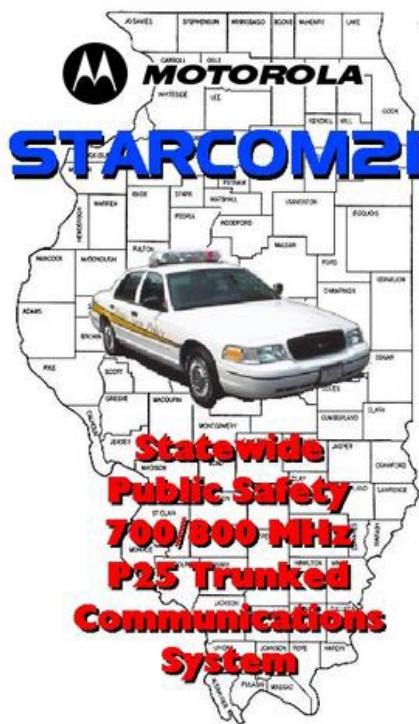
Last fall the Illinois State Police finished their transition to the new StarCom21 trunked radio system, which is actually owned and operated by Motorola. The system is designed to provide coverage throughout the state in three regions: North (Region 1), Central (Region 2) and South (Region 3). Numerous federal, state and local agencies are using the system, even as frequencies and repeater sites are still being fine-tuned.

StarCom21 operates in both the 700 MHz and 800 MHz bands using APCO Project 25 (P-25) standards for both voice and trunking operations. This means that voice traffic will be digital rather than analog. It also means that a newer digital scanner will be needed to properly track the control channel. The 9600-baud P-25 trunking standard is different from the old Motorola 3600-baud standard and cannot be tracked using older scanners.

There are four scanners currently on the market that are capable of tracking activity in the 700 MHz band: Uniden's BCD396 handheld and BCD996 base/mobile, and GRE's PSR-500 handheld and PSR-600 base/mobile. All four of these scanners are fully digital-capable and can correctly track StarCom21 activity.

Older scanners, even if digital-capable, fall short in certain areas. For instance, the Radio Shack PRO-96, although able to track and monitor 800 MHz activity, cannot track correctly in the 700 MHz band.

Unfortunately, the PRO-97 scanner mentioned in William's letter is not capable of scanning any digital activity and will not be useful for monitoring the StarCom21 system. It works very well for analog systems and mili-



tary air band monitoring, but does not have the necessary circuitry and firmware to understand Project 25

❖ Illinois State Police

Illinois State Police (ISP) District 20 out of Pittsfield has been on StarCom21 since last August. Adjacent Districts 9 and 14 also made the switch about the same time.

A site number uniquely identifies each repeater site in the StarCom21 system. Zone 1 sites have a number between 100 and 199; Zone 2 sites have a number between 200 and 299; and Zone 3 sites have a number between 300 and 399. Not all of these numbers are used, since there are only about 200 active and planned repeater sites in the state.

Based on geographic coordinates, the four nearest repeater sites to Rushville are identified as 209, 211, 215, and 224.

Site	Location	County	Control Channel Frequencies
209	Bluff Springs	Cass	775.28125, 775.53125
211	Augusta	Schuyler	866.9375
215	Mount Sterling	Brown	866.9125, 866.3875
224	Macomb	McDonough	866.9625

The Illinois State Police have a number of talkgroups in the Central Zone (Region 2), which correspond to ISP Districts 6, 8, 9, 10, 14 and 20.

Decimal	Hex	Description
13056	3300	Internal Investigations
13057	3301	Internal Investigations
13058	3302	Executive Protection Unit
13059	3303	Executive Protection Unit
13060	3304	Command Unit
13061	3305	Command Unit
13062	3306	Command Unit
13063	3307	Special Event Dispatch
13064	3308	Special Event Car-to-Car
13065	3309	Critical Incident
13066	330A	Critical Incident
13067	330B	Tactical Response Team

13068	330C	Tactical Response Team
13069	330D	Tactical Response Team
13070	330E	Forensic Services
13071	330F	Operational Services Command
13072	3310	Operational Services Command
13073	3311	Fire Interoperability
13074	3312	Emergency Medical Services Interoperability
13075	3313	Federal Interoperability

There are also talkgroups reserved for specifically for District 20:

Decimal	Hex	Description
13011	32D3	Illinois State Police District 20 Dispatch A
13012	32D4	Illinois State Police District 20 Dispatch B
13024	32E0	Illinois State Police District 20 Detail A
13025	32E1	Illinois State Police District 20 Detail B
13031	32E7	Illinois State Police District 20 Patch to IREACH
13037	32ED	Illinois State Police District 20 Patch to ISPERN
13049	32F9	Illinois State Police District 20 Car-to-Car

❖ Additional Resources

As I've mentioned in previous columns, the Internet has been a critical, enabling tool for Illinois scanner listeners to share information about StarCom21. There is a very active Yahoo group at groups.yahoo.com/group/StarCom21 with more than 500 members. Participants share their discoveries and observations about the system and have gradually built up a detailed set of frequencies and talkgroups throughout the state.

Another source of information is CARMA, the Chicago Area Radio Monitoring Association. Their web site at www.carmachicago.com has documents and links for a wide variety of radio systems in Illinois.

❖ BC245XLT

Hi Dan,

I recently got a Uniden BC245XLT scanner. I understand what trunking is, but not how to do it. I am getting so frustrated I am ready to throw it out the window! The owner's manual is not too helpful. Where can I go for help to learn how to program the scanner?

Any help would be greatly appreciated!

Joey via the Internet

Programming scanners, especially for trunking, can be a challenging and sometimes frustrating experience. As Joey mentions, the documentation that comes with scanners is not always clear or even particularly helpful. In some cases there are typographical and even procedural errors printed in the manuals.

The BC245XLT is a handheld scanner built by Uniden and introduced in 1999. It can trunk-track analog Motorola systems as well as operating in conventional mode. Although it's now more than eight years old, it remains a popular and reliable scanner for listeners who do not need digital capabilities or the ability to track Logic Trunked Radio (LTR) systems.

Early 245XLT printed manuals contained several errors, which are corrected in later revisions and are listed here:

Page	Correction
7	Preprogrammed service (SVC) scan (not search)
31	9. To store another frequency, select another channel for the new frequency by pressing MAN (not E)
41	6. Repeat steps 4 and 5 until (not steps 3 and 4)
52	1. Press SCAN to begin. (not MAN)
54	1. When your scanner stops on an ID you want to store, press HOLD (not SCAN)
59	8. Repeat steps 6 and 7 until (not steps 8 and 9)
59	See page 81 for more information (not page 68)
61	To turn Status Bits off, press and hold SCAN for two seconds (not press and hold for two seconds)
62	You may need a DB-9 to DB-25 adapter (not null-modem adapter)

If you have an earlier printed manual, it may be worthwhile to download and print out a corrected manual from Uniden's web site at www.uniden.com or from a link on my web site at www.signalharbor.com/bc245xlt.html

The Uniden manual describes trunk-tracking beginning on page 36, and explains some of the differences between Type I and Type II systems made by Motorola. For Type I systems you'll need to provide a "Fleet Map," which allows the scanner to figure out how to interpret control channel messages. Type II systems are easier to program, since they do not require a Fleet Map.

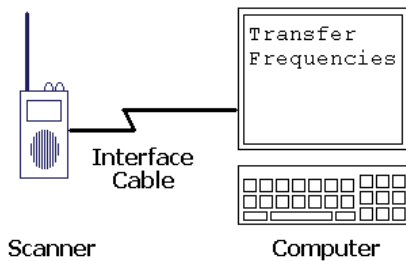
The most common source of error in programming EDACS systems is getting the frequencies in the proper Logical Channel Number (LCN) order. Because EDACS control channel messages use these relative LCNs to refer to a frequency, rather than the Motorola method of using absolute channel numbers, the actual frequencies must be entered in the proper scanner memory locations in order to track properly.

For specific programming and operating assistance, there is an Internet discussion group dedicated the BC245XLT at groups.yahoo.com/group/BC245XLT with more than 2,000 members. Posting questions in the group or checking the file storage area are often quick ways to get a resolution to your problem or concern.

❖ Scanner Programming and Control

It can be tedious and error-prone to enter a lot of frequencies properly via the keypad on the front of the scanner. Fortunately, the BC245XLT and nearly all late-model scanners have the ability to upload programming information from a personal computer (PC) through an interface port. The BC245XLT manual calls this the "Remote Interface" and provides the ability to program and control the scanner using software on your PC. The manual describes this feature beginning on page 70 and the steps necessary to prepare the scanner.

PC software for the BC245XLT is available on the Internet in various places. The Yahoo group is a great place to start, since you can find recommendations and reviews for the various packages that are available. Some programs are free, such as "BC245int" (www.mousetrap.net/~mouse/scanner/245itut.html), which even has its own Yahoo discussion group at groups.yahoo.com/group/bc245int. Other free programs include "Control Freq Jr" at www.freqofnature.com/software/controlfreqjr and "ID Tracker" at bellsouthpwp.net/k/d/kd5eis/IDTracker/IDTracker.htm.



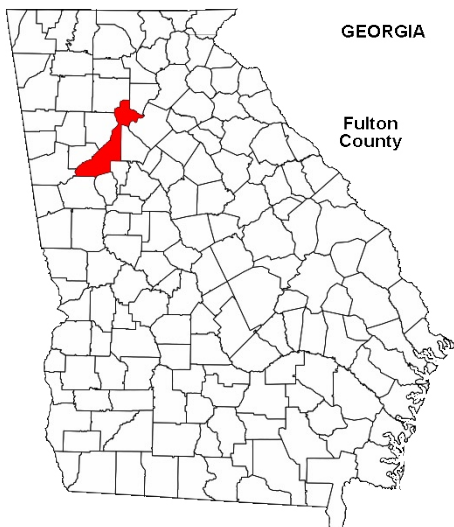
There are also commercial programs for the BC245XLT, including "ScanControl" from 3D Technologies (www.scannersoft.com) and "Scancat" from Computer Aided Technologies (www.scancat.com).

Please read the recommendations and reviews before spending a lot of time downloading and configuring software. There are many differences between various software packages and it can be time-consuming to get a package running, only to find that it doesn't meet your needs.

You can get more information about these packages from the Radio Control Software page on the Radio Reference web site at wiki.radioreference.com/index.php/Radio_Control_Software and the Strong Signals Radio Monitoring Software page at www.strongsignals.net/access/content/software.html.

❖ Atlanta, Georgia

Last October the Atlanta City Council voted unanimously to purchase a \$41 million



APCO Project 25 digital radio system from Motorola. The stated goal of the new system is to improve communication between city police and fire departments as well as with agencies in surrounding areas. It will replace a 12-year-old Motorola analog radio system that, according to the City, has reached the end of its life span. The price tag includes new radio equipment, installation, testing and training.

One factor contributing to the new system is the upcoming move of the city's Public Safety Answering Point (PSAP) 911 Center to a new facility at 180 Peachtree Street. Proponents of the new system pointed out that it would not be possible to move the old analog system to the new facility, due to the age of the system and lack of available spare parts.

The new system will take about 14 months to install, so in the meantime the current radio system will continue to serve a number of city agencies as well as Atlanta Hartsfield Airport and the Georgia State Police.

Operating frequencies are 856.4625, 856.4875, 857.4625, 857.4875, 858.2375, 858.4375, 858.4625, 858.4875, 858.7625, 858.9375, 859.2375, 859.4375, 859.4625, 859.4875, 860.2375, 860.4625, 860.4875, 860.7625, 860.9375, 866.0625, 866.3125, 866.6125, 866.7875, 866.8625, 867.1375, 867.1875 and 867.3125 MHz.

Dec Hex Description

32080	7D5	Atlanta Police Command
32112	7D7	Atlanta Police Administration
32144	7D9	Atlanta Zone 1 Dispatch (West)
32208	7DD	Atlanta Zone 2 Dispatch (North)
32272	7E1	Atlanta Zone 3 Dispatch (South)
32336	7E5	Atlanta Zone 4 Dispatch (Southwest)
32400	7E9	Atlanta Zone 5 Dispatch (Downtown)
32496	7EF	Atlanta Zone 6 Dispatch (East Center)
32560	7F3	Atlanta Special Operations (Dispatch)
32592	7F5	Atlanta Special Operations
32848	805	Housing Authority Police
33680	839	All Public Safety
33712	83B	Mayor Security
33424	829	Atlanta Police Operations 1
33456	82B	Atlanta Police Operations 2
33584	833	Atlanta Police General
33744	83D	Airport Fire Administration
33776	83F	Airport Fire Operations
33808	841	Airport Fire Tactical 1
33840	843	Airport Fire Rescue
33872	845	Airport Fire Tactical 2
33904	847	Airport Administration
33936	849	Airport Operations
33968	84B	Airport Field Maintenance
34000	84D	Airport Emergency
34032	84F	Airport Facilities 1
34064	851	Airport Facilities 2
34096	853	Airport Police Investigation
34128	855	Airport Police K-9 Units
34160	857	Airport Police Patrol Units
34192	859	Airport Police Tactical
34224	85B	Airport Police Dispatch
34672	877	Atlanta Fire Dispatch
34704	879	Atlanta Fire Tactical 2
34736	87B	Atlanta Fire Tactical 3
34768	87D	Atlanta Fire Tactical 4
34800	87F	Atlanta Fire Tactical 5

34832	881	Atlanta Fire Tactical 6
34864	883	Atlanta Fire Tactical 7
34896	885	Atlanta Fire Arson
34928	887	Atlanta Fire Inspectors
34960	889	Atlanta Fire Medical 1
34992	88B	Atlanta Fire Medical 2
35024	88D	Atlanta Fire Training
35056	88F	Atlanta Fire Command
35088	891	Atlanta Fire Operations
35120	893	Atlanta Police Zone 1 Emergency
35152	895	Atlanta Police Zone 2 Emergency
35184	897	Atlanta Police Zone 3 Emergency
35216	899	Atlanta Police Zone 4 Emergency
35248	89B	Atlanta Police Zone 5 Emergency
35280	89D	Atlanta Police Zone 6 Emergency
35376	8A3	Atlanta Fire Emergency
35536	8AD	Atlanta Police Announcements
37392	921	City Jail Administration
37488	927	City Jail Detention
37520	929	City Jail Detention Annex
37776	939	City Jail Transportation
37808	93B	City Jail Response Team
38800	979	Building and Zoning
38928	981	Public Works
39376	99D	Public Works
39408	99F	Public Works
39312	999	Atlanta Fire Mutual Aid
40016	9C5	Atlanta Police Special Weapons and Tactics
40560	9E7	Housing Inspectors
40720	9F1	Public Works Announcements
41680	A2D	City School Buses (Primary)
41744	A31	City School Buses (Secondary)
42960	A7D	Metro Special Weapons and Tactics
44176	AC9	Department of Public Safety (DPS) Capitol Police
44208	ACB	State Patrol - Atlanta Dispatch
44240	ACD	State Patrol - Atlanta Tactical 1
44272	ACF	State Patrol - Atlanta Tactical 2

You can also listen to Atlanta Police and Fire live via the Internet at the web site www.scanfulton.com

Atlanta lies within Fulton and DeKalb Counties, both of which operate Motorola Type II trunked radio networks. Nearby Gwinnett County also operates a Motorola radio system. Some agencies in Cobb County, just to the northwest of Atlanta, have moved to the Georgia Emergency Wireless Interoperable Network (GEWIN), a statewide APCO Project 25 radio system. The older Cobb County system, another Motorola Type II, still carries County Fire and other services.

There are also live scanner feeds for Cobb County (www.scancobb.com), DeKalb County (www.scandekalb.com) and Gwinnett County (www.scangwinnett.com). These web sites also include news items and links to other live feed sites in Georgia and elsewhere.

That's all for this month. I encourage you to scan new frequencies and new systems, and let me know what you find via e-mail at danveeneman@monitoringtimes.com. You can also get more information and scanners and Project 25 systems on my web site at www.signalharbor.com. Until next month, happy scanning!

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CEI Special Price \$169.95

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The Bearcat BCT8 scanner, licensed by NASCAR, is a superb preprogrammed 800 MHz trunked highway patrol system scanner. Featuring TrunkTracker III, PC Programming, 250 Channels with unique BearTracker warning system to alert you to activity on highway patrol link frequencies. Preprogrammed service searches makes finding interesting active frequencies even easier and include preprogrammed police, fire and emergency medical, news agency, weather, CB band, air band, railroad, marine band and department of transportation service searches. The BCT8 also has preprogrammed highway patrol alert frequencies by state to help you quickly find frequencies likely to be active when you are driving. The BCT8 includes AC adapter, DC power cable, cigarette lighter adapter plug, telescopic antenna, window mount antenna, owner's manual, one year limited Uniden warranty, frequency guide and free mobile mounting bracket. For maximum scanning enjoyment, also order the following optional accessories: External speaker ESP20 with mounting bracket & 10 feet of cable with plug attached \$19.95. Magnetic Mount mobile antenna ANTMMBNC for \$29.95.



Bearcat® BCD396T Trunk Tracker IV

Suggested list price \$799.95/CEI price \$519.95

APCO 25 9,600 baud compact digital ready handheld TrunkTracker IV scanner featuring Fire Tone Out Paging, Close Call and Dynamically Allocated Channel Memory (up to 6,000 channels), SAME Weather Alert, CTCSS/DCS, Alpha Tagging. Size: 2.40" Wide x 1.22" Deep x 5.35" High

Frequency Coverage:

25,000-512,000 MHz., 764,000-775,9875 MHz., 794,000-823,9875 MHz., 849,0125-868,9765 MHz., 894,0125-956,000 MHz., 1240,000 MHz - 1300,000 MHz.

The handheld BCD396T scanner was designed for National Security/Emergency Preparedness (NS/EP) and homeland security use with new features such as **Fire Tone Out Decoder**. This feature lets you set the BCD396T to alert if your selected two-tone sequential paging tones are received. Ideal for on-call firefighters, emergency response staff and for activating individual scanners used for incident management and population attack warning.

Close Call Radio Frequency Capture - Bearcat exclusive technology locks onto nearby radio transmissions, even if you haven't programmed anything into your scanner. Useful for intelligence agencies for use at events where you don't have advance notice or knowledge of the radio communications systems and assets you need to intercept. The BCD396T scanner is designed to track Motorola Type I, Type II, Hybrid, SMARTNET, PRIVACY PLUS, LTR and EDACS analog trunking systems on any band. Now, follow UHF High Band, UHF 800/900 MHz trunked public safety and public service systems just as if conventional two-way communications were used. **Dynamically Allocated Channel Memory** - The BCD396T scanner's memory is organized so that it more closely matches how radio systems actually work. Organize channels any way you want, using Uniden's exclusive dynamic memory management system. 3,000 channels are typical but **over 6,000 channels are possible** depending on the scanner features used. You can also easily determine how much memory you have used and how much memory you have left. **Preprogrammed Systems** - The BCD396T is preprogrammed with over 400 channels covering police, fire and ambulance operations in the 25 most populated counties in the United States, plus the most popular digital systems. **3 AA NiMH or Alkaline battery operation and Charger** - 3 AA battery operation - The BCD396T includes 3 premium 2,300 mAh Nickel Metal Hydride AA batteries to give you the most economical power option available. You may also operate the BCD396D using 3 AA alkaline batteries. **Unique Data Skip** - Allows your scanner to skip unwanted data transmissions and reduces unwanted birdies. **Memory Backup** - If the battery completely discharges or if power is disconnected, the frequencies programmed in the BCD396T scanner are retained in memory. **Manual Channel Access** - Go directly to any channel. **LCD Back Light** - A blue LCD light remains on when the back light key is pressed. **Autolight** - Automatically turns the blue LCD backlight on when your scanner stops on a transmission. **Battery Save** - In manual mode, the BCD396T automatically reduces its power requirements to extend the battery's charge. **Attenuator** - Reduces the signal strength to help prevent signal overload. The BCD396T also works as a conventional scanner to continuously monitor many radio conversations even though the message is switching frequencies. The BCD396T comes with AC adapter, 3 AA nickel metal hydride batteries, belt clip, flexible rubber antenna, wrist strap, SMA/BNC adapter, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO or ESAS systems. Order on-line at www.usascan.com or call 1-800-USA-SCAN.



Bearcat® BC246T Trunk Tracker III

Suggested list price \$399.95/CEI price \$214.95

Compact professional handheld TrunkTracker III scanner featuring Close Call and Dynamically Allocated Channel Memory (up to 2,500 channels), SAME Weather Alert, CTCSS/DCS, Alpha Tagging. Size: 2.72" Wide x 1.26" Deep x 4.6" High

Frequency Coverage:

25,000-54,000 MHz., 108,000-174,000 MHz., 216,000-224,9800 MHz., 400,000-512,000 MHz., 806,000-823,9875 MHz., 849,0125-868,9875 MHz., 894,0125-956,000 MHz., 1240,000 MHz - 1300,000 MHz.

The handheld BC246T TrunkTracker scanner has so many features, we recommend you visit our web site at www.usascan.com and download the free owner's manual. Popular features include **Close Call Radio Frequency Capture** - Bearcat exclusive technology locks onto nearby radio transmissions, even if you haven't programmed anything into your scanner. **Dynamically Allocated Channel Memory** - Organize channels any way you want, using Uniden's exclusive dynamic memory management system. 1,600 channels are typical but **over 2,500 channels are possible** depending on the scanner features used. You can also easily determine how much memory is used. **Preprogrammed Service Search (10)** - Makes it easy to find interesting frequencies used by public safety, news media TV broadcast audio, Amateur (ham) radio, CB radio, Family Radio Service, special low power, railroad, aircraft, marine, racing and weather frequencies. **Quick Keys** - allow you to select systems and groups by pressing a single key. **Text Tagging** - Name each system, group, channel, talk group



ID, custom search range, and S.A.M.E. group using 16 characters per name. **Memory Backup** - When power is lost or disconnected, your BC246T retains the frequencies that were programmed in memory. **Unique Data Skip** - Allows the BC246T to skip over unwanted data transmissions and birdies. **Attenuator** - You can set the BC246T attenuator to reduce the input strength of strong signals by about 18 dB. **Duplicate Frequency Alert** - Alerts you if you try to enter a duplicate name or frequency already stored in the scanner. **22 Bands** - with aircraft and 800 MHz. The BC246T comes with AC adapter, 2 AA 1,800 mAh nickel metal hydride batteries, belt clip, flexible rubber antenna, wrist strap, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. For more fun, order our optional deluxe racing headset part #HF24RS for \$29.95. Order now at www.usascan.com or call 1-800-USA-SCAN.

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Bearcat 350C 50 channel desktop/mobile scanner.....	\$104.95
AOR AR16BQ Wide Band scanner with quick charger.....	\$199.95
AOR AR3000AB Wide Band base/mobile receiver.....	\$1,079.95
AOR AR5000A+3B Wide Band 10 KHz to 3 GHz receiver.....	\$2,599.95
AOR AR8200 Mark IIIB Wide Band handheld scanner.....	\$594.95
AOR AR8600 Mark II Wide Band receiver.....	\$899.95
AOR AR-ONE Government/Export sales only 10 KHz-3 GHz.....	\$4,489.95
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Tugs to Teleprinting: 21st Century Maritime Radio

Communication in the 21st century poses a variety of challenges. This month, we look at three solutions. One is to keep alive a very old mode, dating more or less to Marconi. Another uses plain old voice radio. The third is the latest effort to make shipboard radio look and feel like the Internet. Let's look at the voice radio first.

❖ Crowley Maritime

Crowley, a privately-held family business which started with one rowboat in 1892, is now a far-flung, international, maritime operation with around 4000 employees in several divisions. One operation, the seagoing tugboat network, can be heard nightly on the high-frequency bands.

The best chance at this one comes around 0500 Coordinated Universal Time (UTC), on 4149.0 kilohertz (kHz), international public maritime channel number 4B. Mode is upper sideband (USB). As you can see in the Utility Logs, this gets reported pretty consistently by Allan Stern in central Florida. He's not far from the shore station, WPE, in Jacksonville.

Here on the US West Coast, we don't hear WPE as well as Allan does. However, the boats are usually readable. According to the web site at www.crowley.com, most of these have 300-watt radios, which can really get out over salt water.

An operator, typically female ("Vikki" and "Ruby" are recent voices), takes formatted operational reports from whatever boats are currently out at sea. A word of warning: The usual words to the wise about keeping overheard information to yourself apply here, because this is most definitely a high-security industry. With that caveat, check the complete list of frequencies appearing in the sidebar.

The Crowley web site also contains lists of all the boats and their radio calls. You won't have to find them all, however. This has also been done for you, in this column.

❖ 500 kHz Morse is Back

Most utility people know about the annual "Night of Nights," first organized by the Maritime Radio Historical Society (MRHS) in the San Francisco Bay Area in California. Every year, these expanding events commemorate the demise of commercial, continuous-wave (CW), Morse code telegraphy in the US maritime service. For a few hours each year, the dits and dahs resound through the ether once again.

What's less well known is that the US Federal Communications Commission (FCC)

never stopped licensing new CW stations in the commercial maritime coastal service. People just stopped wanting them.

While everyone else was dithering about whether to reallocate this old band, the MRHS had another idea. Why not actually apply for new licenses, with the stated aim of preserving the useful skills and techniques that were abandoned more for economic than technical reasons?

The FCC seemed to agree. It approved three new licenses, with more likely to come.

First and largest is KSM, co-located with historic KPH. Both of these stations are restored and operated by MRHS from Point Reyes National Seashore, just north of San Francisco. KSM is licensed on the international calling frequency of 500 kHz, and on a working channel of 426. It will take traffic from any ship out there which has retained the capability to send it.

KSM is also licensed on HF. Typically, it tests every Saturday, with press and weather messages on these CW frequencies: 4350.5, 6474.0, 12993.0, and 16914.0. More recently, KSM has added Baudot radio teletype (RTTY) and Simplex Telex Over Radio, mode B (SI-TOR-B). These are also heard Saturdays, on 8433.0, and 12631.0 kHz. Authorized power on all frequencies is 5000 watts.

Another station is KDR, licensed to James A. Dalke in Bellevue, Washington, for 5000 watts CW on 500 and 482 kHz. Third is WFT, Joseph R. Venable in Palmetto, Florida, again 5000 watts CW, on 500 and 486 kHz.

Note that all of these are fully authorized radio stations, required to meet engineering and operation standards using qualified personnel. This is hardly frivolous, as was stressed in the applications. Even though real potential for profit is long gone, they fully intend to keep this band and mode open as a demonstration of a great communications system that lasted 100 years.

❖ KKL

Literally as this column is being sent to press, yet another new coastal station has a strong signal into Southern California on 4015, 8182, and 13173 kHz. It's KKL, shown in FCC records as licensed to Sean C. Malone and Walter E. Kaelin, transmitting from near Seattle, Washington, on Vashon Island.

The mode being used is yet another variant of Packet Teleprinting Over Radio (PacTOR), a proprietary modem licensed by SCS in Germany. It sends the standard Kiel Radio/Global Link Network e-mail system idler of ten 1-second

bursts followed by three half-second ones.

Unlike most of these e-mail network nodes, KKL is nice enough to also drop in a CW marker every 3 minutes. So here is even further evidence that coastal radio is quite alive and kicking. We'll have more about this network next month.

CROWLEY MARITIME USB

Shore station:

WPE, Jacksonville, FL (30° 20' 09" N, 81° 37' 40" W)
4149.0 (Ch. 4B)
6224.0 (6A)
8294.0 (8A)
8297.0 (8B)
12353.0 (12A)
16529.0 (16A)

Seagoing Tugboats:

WBH 9635	Sea Victory
WBH 9636	Sea Voyager
WBL 8673	Sea Flyer
WBM 5088	Pt. Barrow
WBM 5091	Pt. Oliktok
WBM 5092	Pt. Thompson
WBM 8730	Sea Swift
WBM 8733	Sea Ranger
WBN 2074	Hercules
WBN 3011	Pilot
WBN 3012	Ensign
WBN 3013	Sentry
WBN 3014	Patriarch
WBN 3015	Adventurer
WBN 3016	Defender
WBN 3019	Sea Breeze
WBN 3022	Centurion
WBN 3023	Jupiter
WBN 3744	Hunter
WBN 4113	Bulwark
WBN 4382	Sea Horse
WBN 4383	Warrior
WBN 5040	Pioneer
WBN 5096	Mariner
WBN 5978	Guardsman
WBN 5979	Ranger
WBN 5980	Commander
WBN 5981	Monitor
WBN 5982	Gladiator
WBN 5983	Cavalier
WBN 6510	Sentinel
WBN 6511	Gauntlet
WBN 6512	Stalwart
WBN 7618	Explorer
WBN 8467	Pathfinder
WBN 8470	Mars
WBO 2511	Guardian
WBO 3337	Invader
WBO 3345	Navigator
WCC 7684	Sea Venture
WCE 8951	Sea Viking
WRC 5254	Sea Cloud
WYP 4482	Crusader
WYT 8432	Sea Robin
WYT 8569	Sea Prince
WYU 2001	Sea King

ABBREVIATIONS USED IN THIS COLUMN

AFB.....	Air Force Base
ALE.....	Automatic Link Establishment
AM.....	Amplitude Modulation
AWACS.....	Airborne Warning and Control System
CAMSLANT.....	Communication Area Master Station, Atlantic
CAMSPAC.....	Communication Area Master Station, Pacific
CAP.....	US Civil Air Patrol
CW.....	On-off keyed "Continuous Wave" Morse telegraphy
DEA.....	US Drug Enforcement Administration
DSC.....	Digital Selective Calling
E03.....	Lincolnshire Poacher, 5-figure groups in female voice
E03a.....	Cherry Ripe, same agency and format, different song
E06.....	Russian KGB, "English Man" AM machine voice
E10.....	Israeli phonetic station (xxx2=null message)
E11.....	"Strich," English "oblique" callup, 5-figure groups
FAX.....	Radiofacsimile
FEMA.....	US Federal Emergency Management Agency
HFDL.....	High-Frequency Data Link
HF-GCS.....	High-Frequency Global Communication System
LSB.....	Lower Sideband
M08a.....	Cuban 3-msg CW/MCW, ANDUWRIGMT = 1-0
M21.....	Russian Air Defense, formatted CW tracking markers
MARS.....	Military Affiliate Radio System
MCW.....	Modulated CW or AM tone Morse telegraphy
MX.....	Russian CW single-letter cluster propagation beacons
MXP.....	Russian "P" marker, occasional voice messages
NASA.....	US National Aeronautics and Space Administration
Navtex.....	Navigational Telex
PSK31.....	Phase-Shift Keying teleprinting at 31.25 baud
RTTY.....	Radio Teletype
Selcal.....	Selective Calling
SHARES.....	Shared Resources, US federal interoperability pool
SITOR-B.....	Simplex Telex Over Radio, Forward Error Correction
SK01.....	Generic for Cuban numbers in ham digital modes
Unid.....	Unidentified
US.....	United States
USCG.....	United States Coast Guard
UK.....	United Kingdom
V02a.....	"Atencion" Spanish numbers, 3-msg format
VOLMET.....	Formatted aviation weather broadcasts

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Universal Time). "Numbers" stations have their ENIGMA (European Numbers Information Gathering and Monitoring Association) designators in ().

- 518.0 VCO-Canadian Coast Guard, Sydney, NS, SITOR-B Navtex ("Q"), at 0640. (Patrice Privat-France)
- 2520.5 T101BD-US Army, also using 3290.5, in ALE at 1346. (Jack Metcalfe-KY)
- 2789.0 FUE-French Navy, Brest, RTTY test loop at 0114. (Tom Severt-KS)
- 3291.0 "P"-Russian Navy CW channel marker (MXP), also on 3327, 3699.5, and 3837, at 1725. (Ary Boender-Netherlands)
- 3476.0 Iberia 6250-Airliner working Gander, NFD, Canada, at 0205. (Severt-KS)
- 4023.9 AAR9AD-US Army MARS Region 8 Net, LSB at 0055. (Mark Cleary-SC)
- 4028.5 Unid-MARS net in Olivia [Robust amateur 16/32 tone teleprinting. -Hugh], at 0039. (Severt-KS)
- 4038.5 NNNORVS-US Navy/Marine Corps MARS, Region 4 Net at 0116. (Cleary-SC)
- 4149.0 WPE Jacksonville-Crowley Maritime, FL, taking formatted position and ops report from WBN 3022, seagoing tug Centurion, at 0515. (Allan Stern-FL)
- 4316.0 NMN-USCG CAMSLANT, VA, live announcer reading weather, then open mike with 5696 kHz traffic audible, at 0533. (Severt-KS) [Coast Guard's "Perfect Paul" voice retired last April, now we have an odd mix of live and new "Iron Mike." -Hugh]
- 4469.0 Florida Cap 904-CAP, state net at 0031. (Cleary-SC)
- 4477.0 040NHQCAP-CAP headquarters, ALE sounding at 0159. (Severt-KS)
- 4490.0 KNY70-US government SHARES net, VA, ALE at 0512. (Privat-France)
- 4500.0 AFA2QB-US Air Force MARS Region 2 2S1 Net, at 0039. (Cleary-SC)
- 4570.0 Russian Intelligence (E06), same message as earlier on 5230, AM

- at 2200. (Mike-West Sussex, UK)
- 4610.0 GYA-UK Royal Navy, Northwood, FAX weather charts at 0246. (Severt-KS)
- 4991.0 NK1-US Federal Bureau of Investigation, Newark, NJ, calling QT1 (Quantico, VA), also on 5058.5 and 7778.5, ALE at 1303. (Cleary-SC)
- 5153.7 "D"-Russian single-letter CW cluster beacon (MX), Odessa, at 2028. (Mike-UK)
- 5154.0 "C"-MX, Moscow, very strong at 2027. (Mike-UK)
- 5201.0 Unid-Russian military air defense, time-stamped CW markers (formerly M21), at 1747. (Boender-Netherlands)
- 5230.0 Russian Intelligence (E06), AM callup 982, identifier/group count 536/98, long message in 5-figure groups, very strong at 2100. (Mike-UK)
- 5379.0 SHQIPONJA-Albanian Ministry of the Interior, working DRINI, ALE at 1002. (Privat-France)
- 5435.0 ART2-Israeli intelligence (E10), identifier only at 2031. (Mike-UK)
- English Man-Russian Intelligence (E06), callup 296, identifier/group count 187/36, message in 5-figure groups, AM at 2100. (Boender-Netherlands)
- 5602.0 R26677-US Army helicopter, working R26648, ALE at 1647. (Privat-France)
- 5696.0 CAMSLANT-USCG, VA, working "N-1-J" for flight ops, at 0030. (Severt-KS)
- 5711.0 Cape Radio-US Air Force, Cape Canaveral, FL, working NASA Booster Recovery Vessel Liberty Star, during STS-120 (Space Shuttle) count-down, at 1320. BRD-NASA Booster Recovery Director, positioning Booster Recovery Vessels Freedom Star and Liberty Star during STS-120 launch, at 1417. (Stern-FL) Freedom Star, passing splashdown positions of boosters to BRD, at 1551 (Cleary-SC).
- 5717.0 Halifax Military-Canadian Forces, NS, working Rescue 903, went to 3047 kHz, at 0007. (Stern-FL)

HF Communication Today Worldwide Broadcast and Utility Radio Stations

TELDE AERO CANARY ISLANDS 5589 KHZ www.klingenfuss.org	
27 Feb 2007, 06:21:11 UTC	ACARS MESSAGE IN AIRMASTER FORMAT
27 Feb 2007, 06:21:11 UTC	ACARS Mode: 2 Aircraft Registration: N13113
27 Feb 2007, 06:21:11 UTC	NACK Label: 5Z
27 Feb 2007, 06:21:11 UTC	Block ID: 2
27 Feb 2007, 06:21:11 UTC	BEGIN OF MESSAGE:
27 Feb 2007, 06:21:11 UTC	M73AC0012026
27 Feb 2007, 06:21:11 UTC	DISP CO120 PAX FAINTED
27 Feb 2007, 06:21:11 UTC	IF WE NEED MEDLINK
27 Feb 2007, 06:21:11 UTC	WHATS A GOOD FREQ TO
27 Feb 2007, 06:21:11 UTC	REACH MEDLINK
27 Feb 2007, 06:21:11 UTC	POSITION 200NM WEST OF
27 Feb 2007, 06:21:11 UTC	STG
27 Feb 2007, 06:21:11 UTC	END OF MESSAGE

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- 5732.0 Omaha 1MR-US Customs, working Hammer (CA), at 0008. (Cleary-SC) Coast Guard 6042-USCG helicopter, securing radio guard with CAMSLANT at 0640. (Stern-FL)
- 5764.0 Lincolnshire Poacher-UK Military Intelligence, Cyprus (E03), musical tune and identifier 21913, simulcast on 6959 and 9251, at 2100. (Boender-Netherlands)
- 6496.4 CFH-Canadian Forces, Halifax, NS, with the "whale song" feedback/whatever sound followed by RTTY weather, at 2323. (Sevart-KS)
- 6501.0 NMN-USCG CAMSLANT Chesapeake, VA, possible live announcer reading Tropical Storm Noel Forecast/Advisory Number 18, signed off at 0543. CAMSPAC Point Reyes, short voice-synthesized test count and gone, at 0545. (Hugh Stegman-CA)
- 6532.0 AM0014-Aeromexico, HF DL position for station 07, Shannon, Ireland, at 0647. (Privat-France)
- 6628.0 New York-Oceanic air route control, working KLM 736 at 2325. (Sevart-KS)
- 6640.0 Saudi Air 021-Saudi Arabian Airlines, working New York at 0715. (Stern-FL)
- 6754.0 Trenton Military-Canadian Forces VOLMET, aviation weather at 2333. (Sevart-KS)
- 6761.0 Hosr 11-US Air Force tanker, working tanker Mover 25, at 2359. (Cleary-SC)
- 6819.6 KGD825-US Environmental Protection Agency, Boston, MA, also on 10202, 11485, 11501.6, and 13488, ALE at 2051. (Metcalf-KY)
- 6855.0 Cuban Spanish AM "numbers" (V02a), 5-figure groups at 1611. (Sevart-KS) V02a, AM callups 52331 71013 81671 and 84771 47633 68775, different days at 2101. (Cam Castillo-Panama) V02a, followed by at least an hour of weird Theremin and vocal music after signing at 2142. (Chris Smolinski-MD)
- 6865.0 XSS-UK Defence HF Communications Service, Forest Moor, working XKY, ALE at 1528. (Privat-France)
- 6906.5 R24387-US Army helicopter, working T2Z147, ALE at 1915. (Privat-France)
- 6911.5 R10240-US Army Chinook helicopter, calling T5B159 (5-159 Aviation), ALE at 1801. (Cleary-SC)
- 6985.0 R26141-US Army helicopter, calling T12 (12th Aviation), ALE at 1955. (Cleary-SC)
- 7038.7 "D"-Russian single-letter CW cluster beacon (MX), Odessa, also on 8494.7, 10871.7, 13527.7, and 16331.7, at 1414. (Boender-Netherlands)
- 7038.8 "P"-MX, Kaliningrad, not same station as 3291, also on 8494.8, 10871.8, and 13527.8, at 1414. (Boender-Netherlands)
- 7038.9 "S"-MX, Arkhangelsk, also on 10871.9 and 16331.9, at 1414. (Boender-Netherlands)
- 7039.0 "C"-MX, Moscow, also on 8495.0, 10872.0, and 13528.0, at 1414. (Boender-Netherlands)
- 7048.0 T7Z101-US Army 101st Airborne, Ft. Campbell, KY, ALE at 1845. (Metcalf-KY)
- 7337.0 Lincolnshire Poacher (E03), in progress, simulcast on 12603, at 1821. (Boender-Netherlands)
- 7512.0 TWLC2-Spanish Guardia Civil, Santander, working TXX1, also on 7527, ALE at 1039. (Privat-France)
- 7523.0 "TW51"-Unknown station repeating a CW calling marker for two minutes, at 1410. (Boender-Netherlands)
- 7527.0 DL1-US Customs remote, Dallas, TX, ALE sound at 0518. PNR400-DEA, Bahamas (voice call is Panther), ALE at 0603. (Privat-France)
- 7635.0 Headcap 40-CAP net control, at 1402. (Cleary-SC)
- 7718.5 T211TH-US Army, also on 12168, ALE at 1902. (Metcalf-KY)
- 7759.0 SULEJA-Nigerian National Petroleum Corporation, ALE at 0554. (Privat-France)
- 7887.0 V02a, callup 74001 15630 52200, AM at 2001. (Castillo-Panama)
- 8009.0 Cuban CW cut numbers (M08a), 5-figure groups in progress at 2301. (Sevart-KS)
- 8086.0 OMQC-Nigerian National Petroleum Corporation, ALE at 0514. (Privat-France)
- 8097.0 Cuban cut numbers (M08a), callup 48022 46682 83005, in distorted MCW at 1902. (Sevart-KS)
- 8122.0 Unid-Amigo Net, weather information for small vessels off Mexico, at 1427. (Sevart-KS)
- 8151.0 TWLG1-Spanish Guardia Civil, Guipuzcoa, working TZSG1, ALE at 1359. (Privat-France)
- 8199.7 PJC-Dutch Navy, Curacao, working aircraft at 2321. (Cleary-SC)
- 8416.5 NMC-USCG, Pt. Reyes, CA, SITOR-B marine information at 0019. (Sevart-KS)
- 8912.0 51A-DEA aircraft, position for Panther (Bahamas), at 1344. (Cleary-SC)
- 8918.0 New York-Oceanic air route control, working Speedbird 207 (British Airways), at 1522. (Sevart-KS)
- 8983.0 Coast Guard 2135-USCG Falcon Jet, working CAMSLANT at 1330. (Stern-FL)
- 8992.0 Offutt-US Air Force HF-GCS, patch for Burst 50, at 2305. (Ron Perron-MD)
- 8294.0 WBN3011-Crowley Maritime tug *Pilot*, working WPE Jacksonville, at 2000. (Cleary-SC)
- 9007.0 Bandsaw Lima-US Air Force E-3 AWACS, patch via Trenton to Rock Star, at 1441. (Cleary-SC)
- 9025.0 470124-US Air Force KC-10 tanker, working ADW, Andrews AFB, MD, ALE at 0658. (Privat-France) Coast Guard 1712-USCG HC-130, patch to District 7 Ops (Miami, FL), at 1731. (Cleary-SC)
- 9031.0 Ascot 4747-UK Royal Air Force transport, selcalled DK-CS by unknown station, at 2037. (Privat-France)
- 9035.0 STANORD-Danish Air Force, Station Nord, Greenland, working FOTAB, US Air Force, Thule, ALE at 1110. (Privat-France)
- 9145.0 HSCOEJOC-US Army Corps Of Engineers, ALE sounding at 1537. (Metcalf-KY)
- 10066.0 MU2168-China Eastern Airlines, HF DL position for station 06, Hat Yai, Thailand, at 1635. OZ0767-Asiana Airlines, HF DL position for 06, at 1649. (Privat-France)
- 10426.0 Lincolnshire Poacher (E03), in progress at 2044. (Boender-Netherlands)
- 10588.0 WGY901-FEMA Region 1, MA, weekly test with WGY904, Region 4, GA, at 1810. (Cleary-SC)
- 10945.0 CFH-Canadian Forces, Halifax, RTTY marker at 1536. (Sevart-KS)
- 11175.0 Mackinaw-US military, sent to 11220 by Ascension HF-GCS, at 0003. Available-Mackinaw before zero zulu callsign change, patch via Ascension HF-GCS to Rail Man for orderwire setup with Andy Gump, at 2322. (Jeff Haverlah-TX) S4JG-US Navy P-3, working Puerto Rico at 1831. Offutt HF-GCS, NE, patching Skull 01 to Shogun (Tyndall AFB, FL?), at 2030. Desirable-US military, two patches to Rail Man via Puerto Rico HF-GCS for troubleshooting orderwire with Andy Gump, at 2240. (Perron-MD)
- 11205.0 Shark 43-Probable USCG, position for Smasher (Joint Task Force, FL), at 0001. (Cleary-SC)
- 11220.0 Mackinaw-US military, came from 11175 for data with Andrews, trouble copying and gone, at 0008. Puerto Rico-US Air Force HF-GCS, attempting to patch Red Fish to Farm Boy for orderwire, at 1431. McClellan-US Air Force HF-GCS, CA, finishing the patch with Red Fish, interrupted for two EAMs, finally done at 1448. (Haverlah-TX)
- 11232.0 Trenton Military-Canadian Forces, patching US Air Force Sentry 42 (AWACS front end) to Phoenix Tactics, at 1514. (Sevart-KS) Ascot 7045-UK Royal Air Force AWACS, working Trenton for weather, at 1635. (Stern-FL) Bandsaw Lima-US Air Force AWACS, patch via Trenton to Radar Maintenance, at 1647. (Cleary-SC) Trenton, weather for Solar 20, at 2235. (Perron-MD)
- 11330.0 New York-Oceanic air route control, selcal LM-EQ to American 1985, a 757 enroute to Puerto Rico, at 1414. New York, selcal RS-EJ to Jet Blue 733, an A320 enroute to the Dominican Republic, at 1418. (Stern-FL)
- 11486.0 Unknown "Strich" station (E11), female voice callup "382 oblique 00," at 0715. (Mike-UK)
- 11494.0 J15-USCG, raised LNT in ALE, then voice as Juliet 15 working CAMSLANT, at 1546. (Sevart-KS)
- 11545.0 Lincolnshire Poacher (E03), very weak at 1900. (Boender-Netherlands)
- 12359 VAX498-"Herb" Net, Canada, passing T.S. Noel position to vessels, at 1952. (Cleary-SC)
- 12397.0 Strich (E11), callup 197/75 and long message, at 0840. (Mike-UK)
- 12431.0 NAPOLI-Italian Guardia Di Finanza (Financial Police), working AVALLONE, ALE at 1106. (Privat-France)
- 12575.3 257923000-Norwegian registry oil tanker *Maritina* (LATL5), DSC call at 1132. 355123000-Panamanian registry vehicle carrier *Hudson Leader* (H9JS), DSC safety test at 1213. (Privat-France)
- 13306.0 Lufthansa 5991, selcal and position for New York at 1535. (Sevart-KS)
- 13354.0 Iberia 6313, sent to 13306 by New York, at 1532. (Sevart-KS)
- 13488.0 005CDCS16-US Centers for Disease Control, ID, working WGY9030, unknown FEMA, at 1532. (Metcalf-KY)
- 13925.5 WUK 4113-Possible US Army Corps Of Engineers, ALE sound at 2010. (Sevart-KS)
- 13927.0 AFA6PF-US Air Force MARS, Los Angeles, CA, several patches to King Ops (Patrick AFB Rescue, FL), for Air Force Rescue 976, with mechanical problems on a search, at 1849. (Stern-FL)
- 14016.0 PUN-MCW beacon (Pista Las Peñas, Ecuador), at 2105. (Castillo-Panama)
- 14109.5 EA2AFR-Spanish amateur on ALE calling frequency for a special operating activity, at 1309. (Privat-France)
- 14653.0 HQ703N-US National Guard Readiness Center, Arlington, VA, working C010TN, CT, ALE at 1202. (Privat-France)
- 15867.0 707-USCG HC-130 (Coast Guard 1707), working LNT (CAMSLANT), ALE at 1226. (Privat-France)
- 16340.7 Unid-Unknown CW station with 5 letter groups, at 1637. (Metcalf-KY)
- 17436.0 V02a, testing with repeated "tres" at 1659, then callup 37861 58888 56558 plus messages, AM at 1700. V02a, callup 92211 21770 4200725, AM at 1700. V02a, callup 50582 21634 446630, AM at 1701. (Castillo-Panama)
- 17478.0 V02a, testing with repeated "tres" at 1549, then callup 37861 58888 56558 and messages at 1600, cut suddenly to Radio Rebelde broadcast audio from 5025 kHz, AM at 1625. Cuban PSK31 "numbers" (SK01), new format which repeats each line, at 1600. (Sevart-KS)
- 17967.0 N256UP-United Parcel Service flight UPS0016, working HF DL station 15, Al Muharraq, Bahrain, at 1314. (Privat-France)
- 18864.0 Cherry Ripe-UK Military Intelligence, Guam (E03a), callup 10990 and 5-figure group message, at 1200. (Mike-UK)

Brazilian Navy Update

This month we look at some changes to the Brazilian Navy HF ALE network and one of the most useful tools in the digital listener's armory – the spectrum analyzer.

The Brazilian Navy appears to have changed formats for its ALE identifiers over the summer and has also revamped its frequency pool. ALE identifiers now begin with GW followed by the regular ITU PWx33 series callsigns for naval bases and GWPW plus a two-letter code for ships. The new frequencies seem to be clustered around the maritime bands. Here are the new details:

Identifiers:
GWPWF33 Fortaleza Naval Base
GWPWB33 Belem Naval Base
GWPWN33 Natal Naval Base
GWPWR44 Recife Naval Base
GWPWZ33 Rio de Janeiro Naval Base

GWPWAR Survey Vessel Ary Rongel
GWPWBL Training Vessel Brasilia
GWPWBO Frigate Bosisio
GWPWCO Frigate Constituicao
GWPWDE Frigate Defensora
GWPWFN Corvette Frontin
GWPWFZ Corvette Inhauma
GWPWGH Frigate Greenhalgh
GWPWIN Frigate Independencia
GWPWJN Corvette Julio de Noronha
GWPWMM Frigate Mattoso Maia
GWPWNI Frigate Niteroi
GWPWRJ Frigate Rio de Janeiro
GWPWRM Frigate Rademaker
GWPWUN Frigate Uniao

Frequencies (kHz USB):

5378, 6298.5, 8301, 10914.5, 11010,
11481, 11498, 12370, 12437, 12589,
12725, 13101, 14780, 15932, 16408,
16607, 16837.5, 16954, 17010, 22168

Also noticed with these new frequencies is MIL-188-110A serial tone high-speed modem activity. Traffic is encrypted with the same style "TEQTEQTEQ..." lead-in as that used by the Venezuelan Forces.

❖ Spectrum Analyzers

Reader Derek from Montana asks, "I've heard that I need a spectrum analyzer program for digital listening. What is it, what does it do and what's the best one I can get?"

This is an excellent question, Derek, as a spectrum analyzer is one of the most important tools in the digital listener's toolbox. A spectrum analyzer usually views the complete audio bandwidth of the receiver, often from 0 to around 4 kHz, and is used to measure the

individual tone frequencies or other frequency components making up a signal. Back in the old days, analyzers used to be very expensive pieces of test gear with CRT or LCD displays, but nowadays even the most basic computer soundcard can provide the basis for an excellent analyzer.

Let's look at two of my favorites at either end of the cost and capability spectrum: the analyzer built into the tools of the Hoka Code300-32 and Digipan, part of an amateur radio software package for the popular PSK31 data mode.

Digipan is a free software package used to both transmit and receive PSK31 signals – a very narrowband but highly efficient data mode. Part of the program is a simple, sensitive and very effective analyzer that provides a display of the receiver's audio spectrum. This analyzer operates in "waterfall" mode, so-called because the signal "falls" downwards from the top of the screen to the bottom.

A small red marker may be moved to any point in the signal's spectrum with a simple click of the mouse. The measured frequency can be read off from the bottom of the program window. The relative strength of the signal at any point in the spectrum can be judged by the color. By default, ambient noise is blue, stronger signals are yellow and the strongest are red. Apart from being able to change the colors used to display the signal strength, that's all there is to Digipan's analyzer: fast, simple, free and effective – which is why I like it.

On the other end of the price range, at roughly \$7000, are the spectrum tools built into Hoka's software.

The first analyzer is displayed permanently with the main selection window as you can see in Figure 1 below.

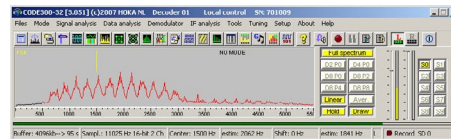


Figure 1: Hoka's main window.

This analyzer also shows a tuning scale, depending on which decoding module is currently active. Here you can see the spectrum of the venerable Russian MS5 12 tone modem (also known by the codename FIRE). Note the stack of buttons to the right of the display which can be used to "zoom" the spectrum to ever finer resolutions. For example, D4 P0 would provide 4x frequency zoom but no phase sensitivity.

The second analyzer provides three views

on the receiver's audio signal as you can see in Figure 2: the full spectrum from 0 to 5kHz, plus a second spectrum which can be adjusted to any portion of bandwidth by moving the two blue markers, and below that, a Digipan-like waterfall.

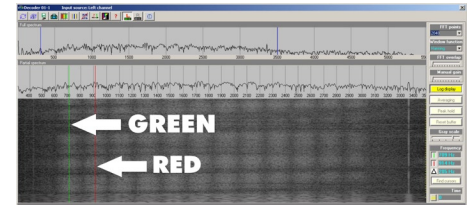
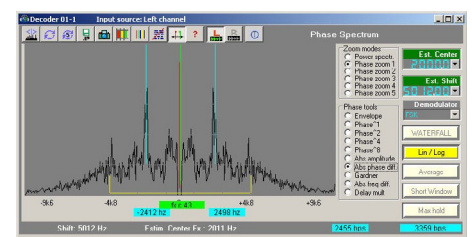


Figure 2: Hoka's Waterfall

The waterfall corresponds to the lower spectrum display. This analyzer can help you measure the individual tone frequencies, and unlike Digipan, also the spacing between two or more tones using the red and green vertical cursors. Here you can see that the spacing between the first and second tone is approximately 200Hz and that the center of the first tone is at +700Hz. Visible to the far right is the modem's pilot tone at around 3350Hz.

The time interval between parts of the signal can also be measured via tiny yellow time "ticks" at the very right hand edge of the screen. Horizontal markers can be added for roughly measuring the burst time or interval between bursts on any ARQ signal.

The final spectrum analyzer in the Code300-32 is a special one, sensitive to the phase information in PSK modulated signals. It is usually used to discriminate between BPSK and QPSK modulated signals and to find the symbol rate (baud rate) of the signal. Figure 3 shows the phase spectrum of a STANAG4259 signal on 6953.2 kHz USB where you can clearly see the two peaks at +/-1200bd.



That's it for this month. Please keep the letters and e-mails coming and enjoy your digital DXing.

Resources
Brazilian Navy
Digipan Page
Hoka

www.mar.mil.br
www.digipan.net
www.hoka.net

No More Frequencies for Shortwave Broadcasting

You may find it hard to believe, since shortwave broadcast stations are bunched into several band segments with mostly empty space between the bands, causing SWBC to interfere with each other and even with hams sharing the 75 and 40 meter bands – but a proposal to allocate more spectrum to SWBC has been turned down at the World Radiocommunication Conference in Geneva.

Only 350 additional kHz in the 4-10 MHz area had been requested, and that was later reduced to 200. Some 25 European administrations

and a few elsewhere supported the expansion, but a majority opposed it, protecting the contended spectrum for military and governmental fixed and mobile use.

Some countries opposing the expansion nevertheless already allow broadcasting in these bands, and it is likely there could be more of this, despite the regulations. Thanks to Mike Barraclough for passing on news about this from Trevor, M5AKA, Southgate ARC, David Sumner and ARRL.

ALBANIA The anonymous announcers on R. Tirana are Klara and Artan, very nice people who may begin identifying themselves by name (Drita Çiço, R. Tirana Monitoring, *DX LISTENING DIGEST*) And they also sent us a program schedule; some of the features: Mon, *Cultural Activities*; Tue, *Mailbox*; Thu, *Albanian Economy*; Fri, *Albanian History*; Sat, *Albanian Mosaic, Folk Music*. Well heard here are Mon-Sat 1530 on 13640, Tue-Sun 0330 on 6110 (gh)

BOLIVIA unID on 5996.44 at 0945-1000 in Spanish (Chuck Bolland, FL, DXLD) 5996.37 at 1017-1030, mentions Bolivia (Arnaldo Slaen, Argentina, *ibid.*) It's R. Loyola, Sucre, reactivated, heard at 2300-2400* with *Cancionero de Siempre*; last reported in 2003 by the late Björn Malm, Ecuador (Rafael Rodriguez, Colombia, *condiglist* yg)

BULGARIA R. Varna's weekly broadcast to the Black Sea, Sun 2200-0400 Mon in B-07 is on 6000, 100 kW non-directional (DX Mix News, Bulgaria) A bit of a collision with Cuba (gh)

CANADA R. Canada Internal, English broadcasts via Sackville, including those aimed eastward but well heard in USA off the back: 1605-1805 9515, 1800-1859 13650 15365 17790; 2100-2159 9770; 0005-0105 (Tue-Sat -0205) 9755. The 1605 and 0005 broadcasts shift one UT hour earlier during the two sesquiweeks of confusion starting March 10 (gh)

9625 heard IDing as "CBC North, Radio One," in the half-hour Northern news and feature show, mostly in English, winter timing M-F 2230; undermodulated and frequency a tad on the low side, as sub-harmonic catchers have noted (gh, OK)

COSTA RICA REE relay really has some interference problems: Vatican unexpectedly started using 5965 during entire 0400-0800 period, though intended for Europe, causing heavy QRM in NAM, and with heavy ACI from CRI via Sackville 5960 until 0600. REE's 9675 is too close to big signal from WYFR 9680. REE 3350 gets intermittent "running water" utility QRM. None of this would be quite so bad if REE had any punch in its modulation, but all its Cariari frequencies are undermodulated and lo-fi, compared to Noblejas. In the daytime, 17850 continued but the spurs were fixed (gh)

CROATIA [and non] For yet another winter season, V. of Croatia and T-Systems thumb their noses at the Region 2 exclusive hamband, using 7285 at 2300-0600 for S & NAM, pretending to target Iceland ("Europe") and Australia/NZ! Three transmitters from two sites in Germany overlap at 0200-0400, and two overlap at 0000-0200, but well synchronized. Any hams who want to sacrifice their signals to 'jam' 7285 would be totally justified in doing so. Why can't Croatia go above 7300 or below 5900, if not in the 49m band? (gh)

Finding a frequency is one thing, but getting it authorized is another. In Germany such an authorization is necessary for any new frequency. Anything below 5900 is a problem. And the range above 7300 (or now 7350) is apparently taboo as well (Kai Ludwig, Germany, DXLD)

Glas Hrvatske, direct from Croatia, on new 3984.83, at 0256-0340 instead of 6165 (Anker Petersen, Denmark, via Dario Monferini, DXLD) Quite weak, sounds like 10 kW instead of listed 100 (Kai Ludwig, Germany, *WORLD OF RADIO*) Supposedly 100 kW, non-directional, to almost all of Europe (gh) 3984.845, clear and fair to weak at 0100 (Terry L Krueger, FL, *ibid.*) Including English // 7285 at 2315, 0300 (Brian Alexander, PA, *ibid.*, Larry Russell, MI, MARE) 3985v really with 10 kW from Deanovec, at 2357-0456; the others 100 kW: 0457-0856 & 1357-2356 6165, 0857-1356 9830 (DX Mix News, Bulgaria)

CUBA RHC's website omits their English broadcast at 2030-2130 on 9505 and stronger 11760 which has a slight delay by comparison; from different sites (gh)

[non] WRMI added a Cuban exile program in English, the first of its kind on SW, "The Voice Of The Center For Human Rights And Democracy Brigade 2506," Sundays at 1600-1615 on 7385 and webcast (gh)

Shortly after R. República canceled broadcasts via Germany on 5910 at end of September, RR appeared with a weak, off-frequency signal on 5954.1, first reported

by Martien Groot, Netherlands, then heard at various times between 2300 and 0400 from California by Dan Sheedy, to Italy by Giampiero Bernardini, best before 0000 when adjacent interference builds up. Programming was not // UK relays on 6135. RR does not reveal its transmitter sites, but we can't help but remember that the last station on 5954 was TIQ, Radio Casino, Costa Rica, which closed a few years ago; same transmitter if not location? It took a while, but finally Cuban grinding jamming came upon it (gh)

EGYPT R. Cairo made some significant changes for B-07, apparently spurred by rock-bottom MUF predictions for this winter of the solar cycle trough. It abandoned 12050 for the multi-hour General Service in Arabic, replaced with 6290 at 1100-0300, changing site at 0000 to a very distorted transmitter; and also dropped from 9990 to 6250 for European languages at 1500-2245, concluding with the sesquihour in English.

More new frequencies just above 6.2 MHz were added for other services, 6225 and 6270 in Turkish, Russian, Urdu. Cairo is not at all reluctant to invade the maritime band above 6200 with no less than four frequencies adding up to almost 28 hours a day.

English to NAM, however, remained on 9465 at 2300-2430, and in the 40m hamband, 7270 at 0200-0330. Spanish at 0045-0200 scheduled on 6140, 7270, 9360 and 9600, but apparently not really on 6140; both it and 9600 collide with Havana. At times, Cairo modulation so low on 7270 as to be undetectable (gh, monitoring and analyzing schedule via BC-DX)

ETHIOPIA [and non] Hunting unsuccessfully for Radio ICDI, Central African Republic, on 6030, Mondays only during the Marti/jamming truce at ICDI's scheduled sign-on 0500, heard something else besides CFVP, Horn of Africa music (Steve Lare, MI, DXLD) Same here at 0401-0500+ (Martien Groot, Netherlands, *ibid.*)

It's a new Ethiopian frequency, first reported on A-DX by Uwe Volk, Germany, at 1905; also heard here (Mauno Ritola, Finland, *ibid.*) My friends in Nairobi identified it as Voice of the Tigray Revolution, // 5980. However, Mauno has also heard IDs for "Radio Oromiya," and has heard 6030 and 5980 carrying separate programming at times, so some mystery remains. Perhaps the Ethiopians have been using it to relay different things? Seems to be on all day, until closing at 2100.

Over the past year, both Voice of the Tigray Revolution and Radio Fana have added extra transmitters and used a variety of frequencies. Recently they have been heard on 5960, 5970, 5980, 6110 and 6185. With Radio Ethiopia on 5990, the 49m band has become a playground for new Ethiopian transmitters. Mauno notes that 6030 has been exceptionally strong in Finland (Chris Greenway, England, *ibid.*) A later Monday at 0455 I heard non-HOA music, maybe ICDI (Lare, *ibid.*)

[non] Before A-07 ended, we were hearing oscillating tones jamming something on 15645 at 1506, nothing listed. Then Ludo Maes confirmed his TDP client Tensae Ethiopia Voice of Unity had shifted from 15660, daily at 1500-1600; but B-07 changed to 11900 via Armavir, Russia, where not heard here, nor any jamming. Due to skip distances, we wonder if the jamming was transmitted from outside Ethiopia (gh, OK)

FRANCE RFI B-07 English, before some changes in Feb:

0400-0430 7315 9805 [M-F]
0500-0530 9805 11995 [M-F]
0600-0630 7315 11995 13680 [M-F]
0700-0730 11725
1200-1230 21620
1600-1700 11615 15160-RSA

RFI deleted two of its Spanish broadcasts, at 1600 & 1800 on 17630 via Guiana French, retaining 2100 on same; and 0100 on 5995 and 9800. RFI can't be bothered to put even a half-hour in English on SW to us, but they still do Spanish to USA! 5995 and 9800 are 295 degrees from Guiana French, and the eastern 3/4 of the USA, CIRA zones 7 and 8 are part of the official target area! (Glenn Hauser, *WORLD OF RADIO*)

*All times UTC; All frequencies kHz; * before hr = sign on, * after hr = sign off; // = parallel programming; + = continuing but not monitored; 2 x freq = 2nd harmonic; sesqui = one and a half; B-07=full/winter season; [non] = Broadcast to or for the listed country, but not necessarily originating there; u.o.s. = unless otherwise stated*

GREECE VOG B-07 runs 9420 23 hours a day, 1100-1000, on 323 degree antenna from Avlis for Atlantic, and NAM; on same beam is 7450 with Macedonian station at 1700-2250. English as timeshifted for winter was expected at: 0700-0800 R. Filia on 12105; Sat 1405-1500 9420 15650 & Sun 0300-0400 7475 9420 12105, both *Hellenes Around the World*; Sun 1105-1200 9420 15650, Mon 0012-0110 7475 9420 12105, both *Greek in Style*, music presented in English (John Babbis, MD, DXLD) As usual, these appear sporadically (gh)

INDONESIA V. of Indonesia inexplicably changes from 9525 to 11785 to 15150 for external services; in mid Oct it left 9525 for 11784.87, including English at 0800, Arabic at 1600 (Ron Howard, CA, DXLD) Blocked here on weekends until 1600 by WHRI, but audible on weekdays before 1600 with gamelan orchestra and English ID loop (gh, OK) 1700-2100*, one-hour blocks of Spanish, German, French and English. Regional news at top of hour, into indigenous/local pop music. Good to very good signal, easy copy (Jim Ducharme, PR, DXLD) Blocked until 1400 by VOA, jamming, in Indonesian -1505* (Noel R. Green, England, *ibid.*) Then back to 9526.0 carrier at 0713 vs. Star Radio via Ascension; 0800 English (Ron Howard, CA, *ibid.*) New website has live streaming, <http://es.voi.co.id/realtime/> (Antônio Schuler, Brasil, via José Miguel Romero, *ibid.*) Announcer in German with heavy Indo accent in the 1800 hour (gh)

IRAN IRIB sent this B-07 English schedule, SW portion only:
1030-1130 15460 17660 SAs
1530-1630 6160 7330 SAs
1930-2030 6225 CEu [via LITHUANIA]
1930-2030 6010 7320 Eu
1930-2030 9855 11695 SAs
0130-0230 6120 7160 NAM [V. of Justice]
(via Mark Schiefelbein, MO, DXLD)

ISRAEL This might be the last schedule for Israel. IBA asked us to close down the service on 31.12.2007. If no change, the SW will be closed. Sorry. Many Thanks, all (Moshe Oren, BEZEQ, DXLD)
English portion, all to NAM/WEu u.o.s.: 0430-0445 6280 7545, CAm/Au 17600; 1030-1045 15760 13855; 1830-1845 6985 7545 9345; SAs 15640. If still on the air, 9345 replaces 6280 March 1. There have been countless reprieves before, but this time? (gh)

JAPAN If there has been any breaking news in Asia since 1410 UT, you will not hear about it in English on R. Japan until 0500 the next day, as there is no news on the only intervening broadcasts at 2200 and 2400. Another broadcast in Japanese that has not really been canceled to NAM is 9535 at 1500-1700; no change in 55 degree azimuth, just different targets designated, skipping western NAM and keeping México, CAm, even Caribbean (gh)

JORDAN R. Jordan, 11690, scheduled in English at 1400-1730 to Eu, USA and E Canada, but from early November really in French until 1600, then English (gh) Heard it announced that French and English services are temporarily sharing a studio due to ongoing work at the broadcast centre. Apologized for "any inconvenience" to listeners. RJ is currently operating only one SW transmitter: on 18110, 0445-0815 & 1130-1345; 11690 1400-1730; 9830 1845-2100; times vary daily by up to 10 minutes (Noel R. Green, England, DXLD) 11810 & 9830 in Arabic (gh)

KOREA NORTH V. of Korea, B-07 English:
0100 7140 9345 9730 NEAs;
11735 13760 15180 C&SA
0200 13650 15100 SEAs
0300 7140 9345 9730 NEAs
1000 6285 9335 C&SA;
6185 9850 SEAs
1300 &
1500 7570 12015 WEu; 9335 11710 NAM
1600 9990 11545 N&ME, NAF
1800 &
2100 7570 12015 WEu
1900 7100 11910 SAs;
9975 11535 N&ME, NAF

(Arnulf Piontek, Berlin, DXLD)

[non] For B-07, Shiokaze/Sea Breeze, for abductees, uses Yamata, Japan site: 1400-1430 5985, 2030-2100 5965 (S. Aoki, NDXC via S. Hasegawa, DXLD) First five days clear, but 5985 jammed from Nov 3, also covering Myanmar 5985.8; English was on a Friday, otherwise Japanese or Korean (Ron Howard, CA, DXLD)

Among other surrogate services for N. Korea: *Furusato no Kaze / Nihon no Kaze*, 1600-1630 9780 Japanese, 1700-1730 9820 Korean.

And CMI / Voice of Wilderness, 1300-1330 9940, 2000-2030 9795 (Northeast Asian Broadcasting Institute in Seoul, www.neabi.com via DXLD) Both via Taiwan, 100 kW at 2 degrees, VTC/Merlin broker (gh)

KURDISTAN [non] V. of Mesopotamia, via Moldova, now on 11530 all the way from 0500 to 1500, but blocked by inconsiderate US station much of the time, WYFR at 05-08 & 12-14. At least WEWN does not come on 11530 until 1500. So that leaves 08-12 & 14-15 clear for VOM (gh, WORLD OF RADIO) Terrible co-channel QRM once again as every winter season, crazy selection (Wolfgang Büschel, Spain, DXLD)

LAOS [non] Hmong Lao Radio shifted one UT hour later on WHRI, 11785 at 1400-1500 Sat & Sun, followed by Hmong World Christian Radio to 1530, both good for exotic music (gh)

LIBERIA [non] For B-07, Star Radio, and Cotton Tree News for Sierra Leone resumed 9525 via Ascension at 0700-0800, ex-13760 via UK, and again heard very well, English and local languages (Brian Alexander, PA, DXLD) Fair here but QRM from Indonesia 9526 het (Ron Howard, CA, *ibid.*)

LIBYA B-07 V. of Africa, 500 kW, daily, with azimuths from Sabrata site, 32-47

N, 12-29 E:

1200-1600 21695 130

1600-1700 15660 230

1700-2000 11965 230

And a second transmitter:

1200-1700 17725 180

1700-1900 15215 180

1900-2000 11860 180

Including English at 1400-1600 on 21695, 17725, both with buzzes, and sometimes better on 21695 (gh, WORLD OF RADIO) VOA is no longer doing short English newscasts at various other times (Dave Kenny, BDXC-UK Communication)

MÉXICO XEYU, Radio UNAM, comes and goes on 9599.3v, but when on, can have a good signal for classical music or news/talk shows, clear at some hours such as 0642, or heavily hitting Vatican at 2315, Cuba at 0300. Relays news from RFI at 1330 weekdays (gh, OK) It's hard to get replacement parts when something breaks, thus the off-air periods (Julián Santiago Diez de Bonilla, DF, DXLD)

MICRONESIA Pacific Missionary Aviation, The Cross, was more or less active on 4755.25 the first two or three weeks of October, then gone again for at least a month (gh) Varied to 4753.3 at 1425-1505 (Olle Bjurström, Sweden, SW Bulletin) No trace of it around 1130-1200 the last week of Oct (Gerry Bishop, FL, WORLD OF RADIO)

MONGOLIA Voice of Mongolia, 12085 in English heard Nov 11 half an hour earlier than before, at 0930 with *Sunday Music Programme* (Christer Brunström, Sweden, DXLD)

MOROCCO IBB relay closing in March: see U S A; see also WESTERN SAHARA

NETHERLANDS Re RNW no longer using Flevo site: we shall be using a variety of transmitter sites outside the Netherlands instead; a business decision following competitive tendering via sealed confidential bids from different transmission service providers as required under European law. Flevo is commercially owned, and a bid was submitted, but not chosen. That doesn't mean we have ruled out using Flevo again in the future. We are saving money, and as a bonus the ability to split our transmissions across more sites means that some listeners can expect stronger signals (Andy Sennitt, Media Network blog) Now KPN has basically two options: Trying to get some other customers on air from Flevo/Zeevolde or mothballing the plant (Kai Ludwig, Germany, DXLD)

PAKISTAN Following the crackdown here, one may have wanted to monitor R. Pakistan for news from the source, but that would only give the government line; little English anyway and it is hard to hear in NAM. B-07: 0730-0830 & 1100-1105 15100 17835; 1600-1615 6240 7520 11570; Assami + partly English, 0045-0115 7445 (gh, from sked via Ifthikhar Hussain Malik, Frequency Management Cell, PBC, via Alokesh Gupta, BC-DX)

Current Affairs Programme, a domestic service at 0200-0400, 1300-1800 is on 4835 ex-5080, in Urdu (Noel Green, England, DXLD) And some English: 4835.4, typically buzzy modulation with English extended to 1635* abruptly off (Jari Savolainen, Finland, *ibid.*)

PAPUA NEW GUINEA At least two more SW stations are planned, to be operated by religious broadcasters. Pacific governments are often strongly aligned to various Christian groups, so when one asks for a broadcasting license, it is likely to be approved in short measure (David Ricquish, NZ, Radio Heritage Foundation)

PHILIPPINES DZRP - Radyo Pilipinas-Overseas, The Voice of the Philippines, B-07, English: 0200-0330 17770 15285 12025. Filipino: 1730-1930 15190 11890 11730. Some programs: M-F 0215-0235 *Dateline Malacañang*, 0235-0245 *Philippine Trivia*; Sun 0202-0230 *Listeners International*. Mon 1905 *Listeners & Friends*; Sat 1830 *Dear Sharon* (Evelyn S. Agato, Manager, via Roberto Gori, via Dario Monferini, DXLD) So are the last two really also in English? (gh)

POLAND PRES, English 1300 via Germany 9450, better than 9525 or 11820 were but not holding up through the hour (Roger Chambers, NY, ODXA yg) Barely audible in CNAm. If Warsaw cared about being heard in NAM, they would use some of their time on Guiana French for that instead of beaming Polish back to Europe – or use Wertachtal at a suitable time and frequency for NAM, like VOR does now on 6155 at 0300 (gh, OK) GUF relays: 2030-2100 9640 11940, 2200-2300 9660 (DTK T-Systems via Wolfgang Büschel, BC-DX)

PORTUGAL RDPI B07 to NAM: 1300-1700 15560; 1700-1900 M-F 17825; 1900-2400 11620; 0000-0300 Tue-Sat 9455 (via Carlos Gonçalves, DXLD) All in Portuguese. Times vary, especially on weekends, depending on sports, but lots of good music. Unfortunately, 11620 blocks India (gh)

RUSSIA VOR B-07 English to NAM:

0200-0300 13735 12040 7250 6240

0300-0400 13735 12040 7350 6240 6155

0400-0500 12010 12040 12030 9855 9840 7350 7150 6240 6155

0500-0600 12040 9855 9840 7350 7150

(via Craig Krist, DXLD)

6155 is best, relay via Wertachtal, Germany; 7350 via Vatican, 6240 Moldova (gh)

R. Tikhyy Okean, Vladivostok, B-07 at 0935-1000 on 5960 7330, ex A-07 0835-0900 on 9765, 12065; 5960 carrier already on at 0918, and 7330 is fair (Ron Howard, CA, DXLD)

SERBIA International Radio Serbia B-07 schedule shows 250 kW non-directional on 7240 at 1400-2200 in European languages, including English at 1400, 1930 daily (via José Miguel Romero, Spain, WORLD OF RADIO) But I assume they were really still using the low-power unit near Belgrade, ex-6100, having promised to get the 250 kW unit at Bijeljina, Bosnia back on air by December 1. Did they? Before then, surely not, 7240 difficult to confirm even in Europe (gh, *ibid.*)

SIERRA LEONE [non] 9525, Cotton Tree News via Ascension, 0730-0756* or

-0800*, drums, news in English, CTN IDs, "The news in local languages" improved from poor to fair, but then Indonesia came back on 9526 with het; see also LIBERIA (Ron Howard, CA, *WORLD OF RADIO*)

SINGAPORE [and non] 6185, RSI, 1115-1315, in Chinese, IDs "RSI," often mentions RSI website, several "Singapore" jingles. Good reception. Scheduled for 1100-1400. I occasionally see postings for China Huayi Broadcast Co. here during same time period, but wonder how CHBC's 15 kW could compete with RSI's 250. Not a trace of them. Does CHBC still change to 4830 in the winter? (Ron Howard, CA, *DXLD*)

SLOVAKIA IRRS, Milan, Italy, refuses to disclose even to HFCC where its transmitters are, but Gordon Brown, NWDXC via BC-DX, discovered that Panamerican Broadcasting's subsidiary European Gospel Radio at www.radiopanam.com/europe.htm reveals it is Slovakia. EGR is one of the services on the IRRS schedule, and the somewhat unusual power 150 kW also matches for Rimavská Sobota. Perhaps this is how disinformation about Albania being the site was spread, since Cërrik also has 150 kW units. Furthermore, a Slovak Telecom document shows an agreement to relay NEXUS/IBA = IRRS on 7285, 9510, 6125 and 15735, which were the A-07 frequencies of IRRS. So IRRS has been from Slovakia at least since last April, including the new Miraya FM Radio to SUDAN, q.v. (gh)

SPAIN REE now airs *Clásicos Populares*, M-F for 55 minutes during the 14 UT hour, with a good signal and audio on 17595 to NAM, but the end always cut off for unnecessary frequency change announcement. Gimmick on this show from RNE's domestic service is listener participation, rating various pieces of classical music, with prizes such as a trip to the Canary music festival.

Amigos de la Onda Corta, the DX program, changed times for B-07, no longer UT Sunday at 0105, but at 0405 on 6055, 6125, 9535, 9620, and via Costa Rica on 3350, 5965, 9675, but 5965 colliding with Vatican; and UT Monday 0330 on same except 9765 instead of 5965 (gh)

SUDAN [non] "Miraya Radio 101 FM" heard testing one Monday only in Sept on 7285 0315-0500+ in Arabic and English. Reply from UN mission in Khartoum said they did plan to use SW a few hours a day (Tarek Zeidan, Egypt, *DXLD*) But nothing further heard in the following month from that UN-sponsored station in Juba, Hirondele Foundation also involved (gh)

Miraya Radio was ready to begin regular SW broadcasts on Oct 25, 1500-1800 on 9825 using NEXUS out of Italy (Al Muick, UN, Haiti, *DXLD*)

But the transmission mixing Arabic dialect and English actually was heard only between 1300 and 1600 by monitors in Europe, Noel Green and Alan Pennington, England, Wolfgang Büschel, Germany, José Miguel Romero, Spain. Miraya, which apparently means mirror, did not reply to our inquiries about the scheduling, or the transmitter site which we later found out is SLOVAKIA [q.v.]. There were hardly any traces of the signal in CNAm, and also blocked by VOA Philippines in Chinese at 1400-1500 but we can hear the live stream via www.mirayafm.org/listen.html

Al Muick explains that Miraya he set up, operates on FM in southern Sudan, studios in Juba and Khartoum, but the Sudanese government won't let them on the air in the north, thus the need for SW, which also serves Darfur (gh)

The SENTECH (South Africa) B-07 schedule shows EDC for East Africa, which means the Sudan Radio Service, and/or Southern Sudan Interactive Radio Instruction, all 250 kW:

Mon-Tue-Wed 0545-0615 15400

Mon-Wed-Fri 0630-0700 15675

Mon-Tue-Sat 1205-1235 17660

Tue-Thu-Sat 1400-1430 15675

The 1400 broadcast is well heard here with English lessons, doorbells (gh) Similar programming at same time on 15390, drum beats between items (Steve Lare, MI; José Miguel Romero, Spain, *DXLD*) This one via Armavir, Russia (gh)

SWEDEN [and non] Radio Sweden B-07 English unexpectedly moved the morning Sackville relay for WNAW two UT hours later after DST instead of one, so now it's at 1530-1600 on 15240, apart from the direct broadcast at 1330-1400 on 15240. 1530 makes it 7:30 am PST instead of 6:30. If you still want to hear RS at 1430, try the Eu/Af/ME/As/Pac frequency 9400 (gh, from sked via Harry Brooks, UK, *DXLD*)

SWITZERLAND It's my sad duty to inform you that one of the best-known and popular personalities of Swiss Radio International, Richard Dawson, passed away suddenly and unexpectedly on Monday November 5th, 2007, in Bern. English by birth, Dick was with the News Department of SRI before joining the English Service in the late 70s. Dick was a very popular figure at SRI, and among the audience as well. We were good personal friends in private, as well as colleagues at SRI. He later joined the *Switzerland in Sound* team. Farewell to a true friend and gentleman. He will certainly be remembered by his many friends and fans (Bob Zanotti, Switzerland, *DXLD*)

TAJIKISTAN 7245, V. of Tajik, Dushanbe, at 1700 "Welcome to the news broadcast from Oruzu Tajik" [= Voice of Tajik]; rest of hour impossible to understand: announcer speaks English softly with heavy accent (Dave Kenny, Scotland, *BDXC-UK Communication*) A possible but challenging catch in NAM at mid-winter (gh)

THAILAND [and non] As previewed last month, the R. Thailand relays via USA on 5890 were canceled, frequency turned over to VOA Spanish, and replaced by direct broadcasts in English at 0030 on 12095, 0200 on 15275, but not audible in CNAm. It so happened that the very last broadcast from Delano was the Thai relay on 5890 until 0329 UT October 28, marred by lengthy audio dropouts (gh, OK)

12095 at 0030 to ENAm with news, ads, sports, lots of fading and flutter, only about 60% intelligible (Steve Wood, MA, *WORLD OF RADIO*)

Poor here, and also heard at 0200 to WNAW on 15275, better at first (Ron Howard, CA, *ibid.*) We might have better results with morning broadcasts intended for Au/SE Asia: 1230 on 9810 in the clear but weak and variable; 1400 on 9725 usually blocked by Costa Rica. Beware of HSK9's own schedule at www.hsk9.com/Schedule.html with mixed-up targets and times (gh, OK)

TIBET [non] Voice Of Tibet B07:

via Taiwan, 11560, 1130-1200 Tibetan

via Tajikistan, 7425 to 7495 varying, 1100-1520 Tibetan/Chinese

via Madagascar, 17550, 1400-1430 & 1530-1600 Tibetan

(S. Aoki via S. Hasegawa, NDXC)

UK [non] BBCWS English relays in the Americas, B-07, azimuths: WHRI: 1100-1200 5875 173, 1200-1300 9660 173, 2100-2300 9525 173. Guiana French: 1100-1300 9750 295, 2200-2300 5975 295. Greenville: 2100-2200 11675 146. Instead of constantly starting late without enough time to retune to 11675 after Hausa until 2100, IBB began using a different transmitter turned on as early as 2050. And presumably in Spanish: 1100-1200 13760 Guiana 305, 6095 Greenville 183 (gh, *WORLD OF RADIO*)

USA [and non] Just days after closing down Delano, IBB announced Nov 2 that due to rising costs, it would also close the Morocco relay in March 2008, and return facility to Government of Morocco by end of 2008. All those SW programs will continue, moved to other sites (IBB via Ben Dawson) Does that mean they have scrapped plans to eliminate several languages? The Briech plant cost \$200 million and was designed for a lifetime of 50 years. 16 km of coax line to the antennas were installed, says an HCDX item of 2003 (Kai Ludwig, Germany, *DXLD*)

Its ten 500-kilowatt transmitters (currently operating at 250) are used for twenty VOA and seven RFE/RL language services (kimandrewelliott.com) A stunner out of the blue, even more surprising than RNW dropping Flevo. The facility is only a dozen years old? Botswana and São Tomé sites would probably pick up any slack to Africa, and there are plenty of lease options for other areas. Is it possible the Moroccans could use it for some different broadcasters? I doubt that it would be turned over to the religious broadcasters! (Stephen Luce, TX, *DXLD*)

VOA's music hour at 2100 via Greenville is back on 15580 for B-season, ex-15445, including: *Mon American Gold*, *Tue Roots and Branches*, *Wed Classic Rock*, *Sat Fusion*. Excellent reception is possible off the back in CNAm, depending on splatter from KTBW 15590, and IBB bringing 15580 up on time; once did not appear until after 2130. The preceding hour of music at 2000 is not on a US transmitter, for *African Beat* weekdays, *Music Time in Africa* weekends; try Botswana 13710 or São Tomé 11975. Before 2000, for other African programming, 11975 is from Greenville.

VOA-sounding synthesized jazzy production music without announcements was heard on a Tuesday at 1444-1506 on 15480, likely a Greenville test frequency.

VOA also rearranged its Spanish schedule, deleting *Buenas Noches, América* from weekdays after 46 years, and starting new hyper 15-minute shows M-F: 1400-1415 on 11840, 17565, *Deportivo Internacional*, sports, and 2300-2315 on 5890, 9885, *Crónicas del Día*, news headlines (gh, *WORLD OF RADIO*)

WORLD OF RADIO time on KAIJ 9480 is Thu 1600, not 1700 as given last month. WRMI times include: Thu 0700, 1530; Fri 0730, 1200; Sat 0900, 2230; Sun 0900, 1615; Mon 0930; Tue 1130, 1630; Wed 0830. All on 9955 except 7385 between 1500 and 1700.

The cricket show on WRMI has been replaced by a slightly more popular ballgame, *World Baseball Today*, really including Asia and Latin America, Sundays at 1530. See also CUBA [non], VENEZUELA [non] for more new shows on WRMI. Hint: you may have better reception via webcast www.wrmi.net than on SW.

WBCQ replaced 18910 by 17495 from November 9, with improved transmitter and antenna. 5110 is being turned over to free radio broadcasters programmed by the Timtron and Cosmik Debris, *Area 51* daily at 2200-2400 (Allan Weiner, WBCQ) 17495.1 confirmed here on reduced carrier USB; mainly for *Lord of the Spirit*, daily 1800-2200 (gh)

VENEZUELA [non] Sporadic segments of R. Nacional de Venezuela, via Cuba appear in English unpredictably; such as a couple days in a row after 1100 on 6060 (Ron Howard, CA, *DXLD*)

New on WRMI is *Acontecer Venezolano* with José Torrellas promoting liberty and democracy, 0245-0300 UT Sundays on 9955 (Jeff White, WRMI)

WESTERN SAHARA Next time you tune in the Polisario clandestine *La Voz de la RASD* on 6300, without fear, keep in mind that according to a *Libertad Digital* news report from Spain, Moroccan police beat someone caught listening to it into a coma (via José Miguel Romero, *DXLD*)

ZIMBABWE [non] SW Radio Africa left 12035 and 11810 relays, replaced in B-07 by 7125, also still constantly jammed 4880 (Gerry Jackson, SWRA, *DXLD*) As announced at *1700 (Jim Ducharme, PR, *DXLD*)

Presumably still 1700-1900; 7125 is via Woofferton, UK (gh)

R. V. of the People, the other clandestine for Zimbabwe, via RNW Madagascar, at 0400-0500 moved to 11610 for B-07 (RNW sked) Heard on final night of previous 9765, covered by a strong music loop jammer making reception pretty much impossible (Brian Alexander, PA, *DXLD*)

Until the Next, Best of DX and 73 de Glenn!

BROADCAST LOGS

NOTEWORTHY LOGS FROM OUR READERS

Gayle Van Horn, W4GVH

gaylevanhorn@monitoringtimes.com
http://mt-shortwave.blogspot.com

0200 UTC on 12025

PHILIPPINES: Radio Pilipinas. Station identification followed by PBS News. SIO 454. **Voice of America** relay via **Philippines** 13650, 1035 Chinese service observing co-channel interference from Voice of Korea. (Peter Ng, Malaysia) Catholic religious station **Radio Veritas Asia**. Indonesian service 11820 // 9505, 2310. (Stewart MacKenzie, Huntington Beach, CA.)

0259 UTC on 7275

TUNISIA: RTT/Radio Tunisienne. Open carrier observed from 0254 to *0259. Arabic sign-on with station information into Koran recitations 0301-0319. Huge signal during announcer's talk and Arabic vocals. (Brandon Jordan, Memphis, TN)

Internet streaming and audio on-demand: www.radiotunis.com/news.html

0315 UTC on 7270

TURKEY: Voice of Turkey. Announcer's program comments to Turkish vocal music and lady announcer's music preview // 5975. SIO 433. (MacKenzie)

Internet streaming audio of AM, FM and shortwave service: www.trt.net.tr/www/trt/canli.aspx

0336 UTC on 6080

SAO TOMÉ: Voice of America relay. Evening newscast featuring coverage on the Czech Republic. SIO 433, French 12035, 2125 **VOA** relay via **Thailand** 13755, 1343. (MacKenzie) 6080, 0315-0345. **VOA** relay via **Botswana** 4930, 0410-0430 // 9885. (Tom Banks, Dallas, TX) **VOA** relay via **Sri Lanka** 11510, 1553-1558.* Music program featuring music from the Beatles. (Joe Wood, Greenback, TN)

Internet streaming and audio on-demand: www.voanews.com/english/Webcasts.cfm.

0320 UTC on 7160

ASCENSION ISLAND: BBC World Service relay. Evening newscast covering Iraq to item on drug laws // 6005 **BBC** relay via **South Africa**. (MacKenzie) **BBC-Ascension Island** 15400, 2145 on ancient Peruvian weather extremes. (Wood)

Internet streaming and audio on-demand: www.bbc.co.uk/

0345 UTC on 5960

CANADA: NHK World/Radio Japan relay. Japanese radio drama with musical vocals. Japanese 11910, 2117; 9655, 2234 via **Ascension Island** relay. Internet streaming and audio on-demand: www.nhk.or.jp/rj/index_e.html. **BBC**

World Service relay via **Japan** 11945 at 2122. (MacKenzie)

0628 UTC on 15135

CHINA: China Radio International. Spanish mentions of Hu Jintao and occasionally China. SIO 353. (Ng). CRI in Chinese 9815, 2248, 11620, 2340, 13640, 2350 // 7330, (via **Mali** relay) 7170, 2357. (MacKenzie) **China National Radio** 5925, 1021-1032. Mandarin // 7620. **CPBS** 6090, 1118-1132 with Radio New Zealand splatter on 6095. (Scott Barbour, Intervale, NH) **CPBS** in Chinese 11610 // 11620 at 2303. (MacKenzie) **Firedrake** (Clandestine) 6150, 0930-1015. Chinese flute music with University Network interference. (Chuck Bolland, Clewiston, FL)

0703 UTC on 4845

MAURITANIA: Radio Mauritanie. Transmitter on at 0703 with French news in progress. S6 signal amid significant static and excessive utility interference. Sign-on too late for 0646 sunrise at transmitter enhancement. Good modulation, audio at decent level despite noise. (Jordan) Arabic service 4845, 2325-2350 with text and music. (Banks)

Internet streaming audio: www.radiomauritanie.com/

0817 UTC on 9720

PERU: Radio Victoria. Surprisingly good signal during Spanish religious programming and announcer's comments. Parallel frequency 6019.46 at threshold level. Subsequent monitoring 6019.43, 0843-0900. (Bolland) 9720.03, 1108. **Radio Tarma** 4774.96, 1048. **Radio Sicuani** 4826.46, 1012-1031+. **Radio Libertad** 5039.2, *1025-1030. (Dave Valko, PA/Cumbre DX) **Radio Huanta** 2000, 4746.9, 2000. (Barbour).

0835 UTC on 9765

RUSSIA: Radiostantsiya Tikhyy Okean. Russian. Interval signal to announcer's station ID. Fair signal during national newscast and comments on Prime Minister Putin. Station heard in presumed Russian 5960, 0955-1000. Internet streaming and audio on-demand: www.ptr-vlad.ru/ **Radio Rossii** presumed in Russian 6075, 1005-1035. (Bolland). **Deutsche Welle** relay via **Petropavlovsk** 15640, 2247 in German. (MacKenzie).

Trans World Radio via **Novosibirsk** in Vernacular religious programming 12085, 0128-0145.* (Barbour). **Voice of Russia** classical music on 11510 at 1750. (Bob Fraser, Belfast, ME).

0838 UTC on 9545

GERMANY: Deutsche Welle. German programming comments between music segments. Fair signal quality. (Bolland) **DW-Rwanda relays** 11865 // 15205, 2102. German 9775, 2245. French 17860, 1755 to 1757.* (MacKenzie). **DW** via **Sri Lanka** relay 21840, 0925. (Ng).

Internet streaming and audio on-demand: www.dw-world.de

1208 UTC on 4920

INDONESIA: RRI-Biak. Indonesian. Jakarta network news relay to 1220. Local programming of English vocal selections by Engelbert Humperdinck. Program announcements to 1301 *Song of the Coconut Islands* interval signal. Fair at tune-in, weak by 1301. (John Wilkins, Wheat Ridge, CO).

1224 UTC on 9580

AUSTRALIA: Radio Australia (via Shepparton). Discussion on capital punishment in southeast Asia and Oceania. Interview concerning Asburner's Syndrome // 9590 good. (Wood).

Internet streaming of ABC radio network, including; ABC Radio National, ABC Local Radio, ABC NewsRadio, triple j, ABC Classic FM, dig, and Radio Australia: www.abc.net.au/radio/listenlive.htm

1545 UTC on 11690

JORDAN: Radio Jordan. Music program of U.S. easy-listening instrumentals to "Radio Jordan 96.3 FM" identification. World newscast at 1600. SIO 454. (Fraser)

Internet streaming of English and Arabic programming: www.jrtv.jo/rj/pages.php?menu_id=18

1600 UTC on 11615

FRANCE: Radio France International. Sign on announcements to identification as a service to North Africa. Several items concerning Sudan during fair signal quality. (Wood) 17605, 1605. African news topics to item on Uganda. SIO 453. (Fraser). Website: www.rfi.fr/

1820 UTC on 13895

USA: WWCR (Nashville, TN). Religious sermon from Pastor Melissa Scott on symbolism of Communion. (Wood)

Internet streaming audio WWCR 1-4 and five AM links: www.wwcr.com/wwcr_listen.html.

American Forces Radio via **Key West, FL** 12135 USB, 1625, 5446 USB, 1128; **WINB** (Red Lion, PA) 13570, 1310. Religious programming to inspirational music. **KTBN** (Salt Lake City, UT) 15590, 2139; **WEWN** (Vandiver, AL) 7595, 2132; **WBCQ** (Monticello, ME) 7415, 0240-0303. (Wood).

1959 UTC on 15476.01

ANTARCTICA: Radio Nacional Arcangel San Gabriel. Latin American style music to "canned" announcement. DJ's live mentions of "Esperanza," followed by music program 2005-2015. Continued promos to "National" reference in midst of mentions of "el mundo noticias." Presumed news briefs returning to instrumental music. Closing announcements at 2059 mentioning "Base Esperanza." (Valko) Similar programming this frequency

2050-2100* amid difficult copy. (Brian Alexander, PA). Antarctica's **Operation Deep Freeze** remains operational and involves active-duty and Reserve C-17 support from McChord AFB, New York, Air National Guard LC-130s, and other aircraft necessary to support the mission. All deployed forces are scheduled to return home in March 2008. Additional details may be found at: <http://mt-milcom.blogspot.com/2007/08/operation-deep-freeze-2007-08-begins.html> Frequency information may be found at www.usap.gov/travelAndDeployment/documents/USAPFieldManual.pdf

2220 UTC on 9420

Voice of Greece. Greek. Announcer's news and presumed program previews. Greek music program of vocals and instrumentals. (MacKenzie). English service noted on 12105, 0710-0740. (Brian Bagwell, St Louis, MO)

Internet streaming audio: <http://tvradio.ert.gr/radio/live-radio/voiceofGreece.asp>

Thanks to our contributors – Have you sent in YOUR logs?
Send to Gayle Van Horn, c/o Monitoring Times
English broadcast unless otherwise noted.

Russia: A Re-emerging Super Power

I have always had a fascination with all things Russian. For some reason, Russia and Russians keep popping up in my life, including in my listening habits. I've blogged about it on my website, the address of which is in the masthead of this column. Look for the entries entitled "My Russia." In university I majored in Slavic Studies, taking Russian language, culture and literature courses – courses taken as a result of my fascination with broadcasts from that country, among other things.

Back in 1978 when I started listening to shortwave radio, the transmissions of Radio Moscow, as it was then known, were omnipresent on all the bands. Often there were multiple frequencies available on each band. Each night, and for much of the day, Radio Moscow would give us the Soviet viewpoint on news and events of the time, and lots of cultural programming.

How the mighty have fallen. The post-Soviet Voice of Russia in many ways is a shadow of its former self.

Today, you still get the Russian viewpoint on news and events of the time, and lots of cultural programming. That is, if you can hear them at all. On shortwave, that is. Like many broadcasters, they have put a big effort into getting their programming on line. More on that later.

As a young listener, I was addicted and would listen many hours each week. 1978 was the era of detente. Brezhnev and Carter were playing nice. It was interesting on many levels. For one, it was fascinating to listen to the "other side" of the Cold War. It was fun to read between the lines, listening to not only what was said, but also what was left out, wading through the propaganda as it were (although I should note that the Radio Moscow of 1978 was not what I expected. Sure, it was the Soviet version of events, but it wasn't hysterical. That was left to the Albanians).

Over the coming years, I would have a front row seat for the Soviet invasion of Afghanistan, the Olympic boycott; the Cold War "heating up" during the Reagan administration, and, with the advent of Gorbachev, perestroika, the coup and the final break-up of the Soviet Union.

Many of the presenters of that time became old friends and household names, such as Lucy Pravdina, Joe Adamov, Carl Yegorov, Boris Belitsky, and Vladimir Posner. Most of these people remained with the station well

into the post-Soviet era (Yegorov, a Canadian by birth, would become Carl Watts).

I've mentioned cultural programming a number of times already. Whether it's called Radio Moscow, or the Voice of Russia, one of the many "hooks" used to attract listeners is the fantastic array of music, culture, history and the arts.

Whether it's 1978 or 2008, the hallmark of the Voice of Russia is music. Russia has a rich tradition of music, from classical to opera, folk to jazz, and more recently a very cool pop/rock scene. The Voice of Russia is a great sampler of all these musical genres.

Russians are also fiercely proud of their history and culture. Great Russian novelists from Lermontov to Pushkin to Turgenev, Chekhov, and Tolstoy are commonly heard from, as well as lesser known writers and composers. The rich history of the country, warts and all, comes alive in numerous programs.

❖ Broadcasts to North America

I've chosen to concentrate on the broadcasts to North America for the purposes of this survey. Voice of Russia is scheduled to North America from 0200-0600 UTC. Each hour begins with the **News**, and there is **News in Brief** on the half hour.

MONDAY:

0200 Moscow Mailbag The late Joe Adamov may be gone, but his spirit lives on in the Moscow Mailbag show, which still occasionally concludes with corny jokes worthy of Joe himself. **0230 Time-lines** is hosted by Estelle Winters (one of my favorite presenters on the world



bands). Estelle chats with visitors to Moscow and expats.

0300 Spotlight on the Young is a youth program hosted by Tamara Murzina and Sonya Tikhomirova. **Lend Lease**, hosted by Olga Troshina focuses on co-operation between the Soviet Union and the rest of the Allies to defeat Germany in WW2. **0330**

Russian by Radio is the popular language course. I'm not sure if it's still the case, but they used to correct your homework if you sent it in! It's hosted by author Alla Leonovich and producer Vladimir Dyomin.

0400 This is Russia A program about the past and present of Russia, its people, nationalities, culture and the arts, hosted by Lyubov Tsarevskaya. **0430 Moscow Yesterday and Today** is a fascinating series about the history of the Russian capital.

At 0500, yet another history series, based on the Russian alphabet is called **Encyclopedia "All Russia."** Each program highlights a letter of the alphabet and some facet of Russian history beginning with that letter; for instance, K is for Kremlin. **0530 The VoR Treasure-Store** presents archival recordings on historical and cultural topics. Recent episodes have featured audio recordings from the time of the Nazi invasion of Russia in 1941, and a dramatic reading of a story by the author Garshin.

TUESDAY:

0200 Russia and the World looks at the latest developments in Russia, and its relations with the world. **0230 Kaleidoscope** is hosted by Irina Simonova. It is a multi-faceted program, with "interviews, talks by specialists, information and music."

0300 News and Views, which dates back to Soviet times, as the name suggests, presents news and commentary, in more depth than the newscasts allow. **0330 Folk Box** is another long-standing program remaining on the schedule from the Radio Moscow era. As the name suggests, it looks at folk music and folklore in Russia. In many listener surveys over the years Folk Box has often been a popular program. You never quite know what you might hear,





evidence of the great cultural diversity of Russia.

0400 **Encyclopedia "All Russia"** 0430 **Guest Speaker** "The Voice of Russia's Guest Speaker daily program is hosted by commentator Vitaly Glazunov and features leading Russian and foreign political scientists, economists and art celebrities. There're also interviews with our listeners, who are always welcome. Our telephone number is (495) 950-5060." Some recent interviews are available for listening on the program's web page. **Spiritual Flowerbed** discussed in a past column, is one of the Voice of Russia's Orthodox Christian programs, featuring reflections by clergy and other spiritual leaders. Some items are available for listening or download on the program page.

0500 **Moscow Mailbag**, 0530 **Music Around Us/Music at Your Request** Music Around Us is presented by Svetlana Yekemenko and "offers a wide range of music styles, features popular Russian performers and composers, new records and music trends in Russia." Music at Your Request is a half hour of listeners' requests in the Classical genre (and another programming holdover from Soviet times).

WEDNESDAY:

0200 **Russia and the World**. 0230 **Russian by Radio**.

0300 **News and Views**. 0330 **Spotlight on the Young/Lend Lease, Musical Tales** Musical Tales is another classical music program. It can be hosted by Olga Fyodorovna or Carl Watts. They provide you with the background to the music you hear and the composers.

0400 **Moscow Mailbag**. 0430 **Guest Speaker**.

0500 **Science Plus** hosted by our friend Estelle Winters, who does a marvelous job in the spot once dominated by venerable Radio Moscow/Voice of Russia science correspondent Boris Belitsky, a fascinating and dedicated science reporter in his own right. Estelle looks at the latest developments in the scientific world, with, of course, a focus on Russia. 0530 **Moscow Yesterday and Today**.

THURSDAY:

0200 **Russia and the World**. 0230 **The VoR Treasure-Store**.

0300 **News and Views**. 0330 **Moscow Yesterday and Today**.

0400 **Science Plus**, 0430 **Guest Speaker** **Spiritual Flowerbed**.

0500 **Newmarket** looks at the "rapidly changing Russian economic scene." Trust me, this program is nothing like the old Soviet reports of tractor production and bumper grain harvests. Russia has gone through an amazing transformation in the past decade or so to a market economy, and this program is a window onto those developments. Judging by this program, Russia is open for business (mostly). 0530 **Folk Box**.

FRIDAY:

0200 **Russia and the World**. 0230 **Kaleidoscope**.

0300 **News and Views**. 0330 **Jazz Show** is perhaps my favorite music show on the Voice of Russia. Hosted by Carl Watts, it brings you some very cool sounds from the Russian jazz scene, and information about the artists.

0400 **Newmarket**. 0430 **Guest Speaker, Russia-1000 Years of Music** presents the listener with an overview of the great musical traditions of Russia. Hosted by Olga Shapovalova, it promises to be "more than a historical chronicle. We will venture to delve into the very essence of what is contained in the words 'Russian music'..."

0500 **Moscow Mailbag**. 0530 **The VoR Treasure-Store**

SATURDAY:

0200 **Russia and the World**. 0230 **The Christian Message from Moscow** is the main spiritual program on the Voice of Russia. It still seems odd to hear voices from the old Radio Moscow reading scriptures, and emphasizing the importance of faith. Listening to programs like this one and Newmarket give the listener a definite impression that, to paraphrase Dorothy in the *Wizard of Oz*, "we're not in the Soviet Union any more, Toto."

0300 **News and Views**. 0330 **Young/Lend Lease Musical Tales**.

0400 **Moscow Mailbag**. 0430 **Guest Speaker**.

0500 **This is Russia**. 0530 **Timelines**.

SUNDAY:

0200 **Moscow Mailbag**. 0230 **Moscow Yesterday and Today**.

0300 **News and Views**. 0330 **Young/Lend Lease Songs from Russia**.

0400 **Music and Musicians** is another program name left over from Soviet times. As the name suggests, it presents music (classical) and talks about the various contemporary artists in Russia. It is unique in that it is the only program in the schedule longer than 30 minutes.

0500 **Encyclopedia "All Russia"**. 0530 **Kaleidoscope**.

❖ How to hear the Voice of Russia.

Sadly, shortwave output has deteriorated from this once dominant broadcaster. Hopefully, once you read this, conditions will have improved and perhaps some frequencies might

be adjusted. Having said that, as this column is written, 6155 kHz and 6240 kHz seem to be the best frequencies to try.

As per the VoR schedule, try:

UTC	Freq kHz
0200	13735, 12040, 7250, 6240
0300	13735, 12040, 7350, 6240, 6155
0400	12010, 12030, 12040, 9840, 9855, 7150, 7350, 6155, 6240
0500	12040, 9840, 9855, 7150, 7350

CBC Radio Overnight on the Radio 1 network in Canada carries some Voice of Russia programming on the weekends.

Voice of Russia programming can also be heard via the World Radio Network www.wrn.org. WRN provides 2 hours per day of downloadable programming in English as well as a number of other languages.

There is also an abundance of programming available on the Voice of Russia website itself. If you go to www.ruvr.ru look at the banner at the top of the page. If you click "Live" it will take you to a page where you have a choice of streams. One stream is all in the Russian language. The other is mostly English, with various hours of other languages as well. *Note the time schedule seems to be in Moscow time. So whereas, the English broadcast is listed from 0600-1300, it actually begins at 0300 UTC, UTC being 3 hours behind Moscow.*

Going back to that homepage, if you click "Our Audio Archive," you can hear Voice of Russia broadcasts in some other languages not available at WRN.

Some individual pages for specific programs also have audio for some recent editions, but this seems to be a work in progress.

❖ Closing Comments

A few final observations. A couple of very good programs are not beamed towards North America. **People of Uncommon Destiny** is either cleverly hidden or I just couldn't find it on the schedule. Perhaps it is on hiatus. It's a program about not-so-ordinary Russians, from a former commandant of Berlin, to legendary hockey player Vladislav Tretiak, to Varvara Nikitin, a stuntwoman. Despite not being able to hear the program, transcripts are available on the VoR website.

Another program that was always an interesting listen, even in Soviet times, is **Focus on Asia and the Pacific**. Someone should remind the Voice of Russia that North America not only has a Pacific coast, but also has a large Asia-Pacific immigrant population.

I started this discussion by suggesting that Voice of Russia was a shadow of its former self. Perhaps in terms of audible frequencies, and hours of broadcast, this is true, but in terms of program quality, the Voice of Russia does a fantastic job, with many hours of excellent programming – a tribute to the hard working staff at the station.

Finally, like so many other stations these days, to really appreciate the diversity of the station, check out the various web resources at www.ruvr.ru. The Voice of Russia website is full of archived material, audio, news, and background material.

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

Gayle Van Horn, W4GVH

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The Future of QSLing

Take a close look at this column each month, and you will likely have noticed an increase in electronic verifications. Once a curiosity to hobbyists and a convenient alternative for cash-strapped broadcasters, eQSLing has become a trend in the radio hobby that has broadened in scope.

There is no doubt that shortwave, medium wave, and FM eQSLing is on the increase. Many pirate operators opt for electronic QSLing to forego the "go-betweens" and post office mail drops. Some clandestines are also using this alternative, thus providing an opportunity to send electronic editorials promoting their cause. Utility QSLing, once the most difficult to pursue, is on the increase, while amateur radio operators have verified over 75 million contacts using the successful electronic *Logbook of the World* project.

As stations downsize or convert to internet broadcasting, the hobby rhetoric continues that the shortwave hobby is dead or there's "nothing left to hear or QSL." I would challenge radio enthusiasts to broaden their focus and consider the hundreds, if not thousands of stations that verify by using the eQSLing technique.

The same courtesies used in postal reporting are used in electronic methods of QSLing. A brief explanation about yourself or the radio hobby, program details from 15-25 minutes of broadcasting, and a friendly verification request should be used when submitting an electronic report.

While this alternative may not be a favorite of the QSL card collector, many stations are using it as an alternative to regular mail and it will likely continue to expand in its usage.

AMATEUR RADIO

Burkina Faso XT2C, 20 meters SSB. Full data color photo card. Received in 57 days for an SASE and \$2.00 US to: F9IE Bernard Chereau-QSL Manager, Boite Postale 211, Noirmoutier En L-ile 85330 France. (L Van Horn, NC)

Jordan JY5HX, 20 meters SSB. Full data color card. Received in 338 days via ARRL bureau. Website: www.arrrl.org (Van Horn)

Liberia EL2AR, 20 metres SSB. Full data color photo card. Received in 191 days for an SASE to: H. Walcott Benjamin Sr. EL2BA-QSL Manager, 285 St. Marks Place, Apt. 4-L, Staten Island, NY 10301 USA. (Van Horn)

LITHUANIA

The Mighty KBC 6255 kHz via Sitkunai. Full data T-shirt/antenna card with transmitter site notation, signed by Tom de Wit, plus personal note and two decals. Received in 20 days for an English report, two IRCs, and souvenir postcard. QSL address: Argonstraat 6, 6718 WT Ede, Netherlands. (Bill Wikins, Springfield, MO) Email reply in 20 days via veri signer to info@k-po.com (Kusalik). Website: www.kbcradio.eu/



MEDIUM WAVE

CJRJ, 1200 kHz AM. Friendly verification letter from Dianne Lee-Manager, plus RJ 1 2 0 0 pen. Received in 30 days for a CD report. Station address: Unit 110, 3060 Norland Avenue, Burnaby BC Canada V5B 3A6. SJRJ (Patrick Martin, Seaside, OR) Based in Vancouver, CJRJ is an ethnic Punjabi station, broadcasting since November 25, 2006.

Internet streaming audio link www.rj1200.com/

KBRW, 680 kHz AM. *Top of the World Radio*. Full data verification on station letterhead, signed by Robert C. Sommer-General Manager/VP, plus station stickers. Received in 14 days for CD report. Station address: c/o Silakkuagvik Communications, Inc., P.O. Box 109, 1695 Okpik Street, Barrow, AK 99723 USA. My most wanted Alaskan station for over 25 years. Station is 10,000 watts to a listening audience of 70% Native American, mainly Inupiat Eskimo. This one made my day! AK QSL # 59. (Martin)



Internet streaming audio link www.kbrw.org/

KTTO, 970 kHz AM. *Sacred Heart Radio*. Station QSL card signed by W. Grapley. Received in 14 days for a CD report. QSL address: c/o EWTN, 5817 Leeds Road, Irondale, AL 35210. (Martin) KTTO website: www.sacredheartradio.org/Links.htm

KUDO, 1080 kHz AM. Prepared QSL card returned as verified and signed by Rich McClear. Received in 12 days for an AM report and prepared QSL card. Station address: 3601 C Street #290, Anchorage, AK 99503-5954 USA. (Martin)

Internet streaming audio link: www.kudo1080.com/

WKSH, Radio Disney AM 1640. Partial data verification on Disney letterhead, signed by Megan DeLaat-Promotions Manager, Marketing, plus station stickers. Received in three days for an AM report and self-addressed-envelope. Station address: W223 N 3251 Shady Lane, Pewaukee, WI 53072-4194 USA. (Eric Hopkins, Ayer, MA)

Internet streaming audio link for WKSH at StreamingRadioGuide.com: <http://streamingradioguide.com/streaming-radio.php?format=21&radio-format=Disney>

PORTUGAL

RDP Internacional 21565 kHz. Full data color QSL card unsigned. Received in 75 days. Sta-

tion address: Av. Marechal Gomes da Costa n° 37, 1849-030 Lisboa, Portugal.

Internet streaming audio at Multi Media link: <http://tv.rtp.pt/EPG/radio/epg-dia.php?canal=5&ac=d&sem=e> (G Van Horn, NC)

RUSSIA

Radiostantsiya Tikhyy Okean (*Radio Station Pacific Ocean*) 5960 // 7330 kHz. Full data blue card and personal letter signed by Alexey Giryuk-Engineer. Received in 41 days for a CD recording, English report and mint postage stamps. Station address: GTRK-Vladivostok, ul. Uborevicha 20-A, 690091 Vladivostok, Primorskiy Kray, Russia. (Jim Pogue, Memphis, TN)

Internet streaming audio link: www.pttr-vlad.ru/ Email: ptr.ro@ptr-vlad.ru Correspondence address via *World QSL Book*.

UTILITY

AIR, 13985 kHz USB. Full data *Armed Forces Day 2007 - America Supports You* card unsigned, plus USAF 60th Anniversary decal. Received in four months for a utility report. Station address: MARS Station AIR, 89CS/SCOR, Bldg 1558, Alabama Ave, Ste 27, Andrews, AFB, MD 20762. (Wilkins).

Non-Directional Beacons: **YZE** 245 kHz. Gore Bay NDB, Manitoulin Island, Gore Bay, Ontario, Canada. Full data prepared card verified as 200 watts. Received in 49 days for \$1.00 US; **YXR**-257 kHz. Earleton NDB, Earleton, Ontario, Canada. Full data prepared card verified as 200 watts. Received in 49 days for \$1.00 US; **ZYB** 404 kHz. Yellek/North Bay NDB, North Bay, Ontario, Canada. Full data prepared card verified as 25 watts. Received in 21 days for \$1.00 US. QSL address for YZE, YXR, ZYB: Nav Canada North Bay Techops, 50 Terminal Rd., Compt. 2, North Bay, ON Canada P1B 8G2. (Pogue).

Bangkok VOLMET 6676 kHz. Full data QSL card plus personal letter from Jantima Niyomchok. Received in 32 days for a utility report and \$2.00 US. Station address: Telecommunications Division, Meteorological Department, 4353 Sukhumvit Drive, Bangna, Bangkok 10260 Thailand. Email: tmd@metnet.tmd.go.th (H. Tidenberg, Salida, CO) Correspondence address via *World QSL Book*.



HOW TO USE THE SHORTWAVE GUIDE

0000-0100 twhfa USA, Voice of America 5995am 6130ca 7405am 9455af
 ③ ④ ⑥ ⑦

Convert your time to UTC.

Broadcast time on ① and time off ② are expressed in Coordinated Universal Time (UTC) – the time at the 0 meridian near Greenwich, England. To translate your local time into UTC, first convert your local time to 24-hour format, then add (during Standard Time) 5, 6, 7 or 8 hours for Eastern, Central, Mountain or Pacific Times, respectively. Eastern, Central, and Pacific Times are already converted to UTC for you at the top of each hour.

Note that all dates, as well as times, are in UTC; for example, a show which might air at 0030 UTC *Sunday* will be heard on *Saturday* evening in America (in other words, 7:30 pm Eastern, 6:30 pm Central, etc.).

Find the station you want to hear.

Look at the page which corresponds to the time you will be listening. English broadcasts are listed by UTC time on ①, then alphabetically by country ③, followed by the station name ④. (If the station name is the same as the country, we don't repeat it, e.g., "Vanuatu, Radio" [Vanuatu].)

If a broadcast is not daily, the days of broadcast ⑤ will appear in the column following the time of broadcast, using the following codes:

Codes

s/Sun	Sunday
m/Mon	Monday
t	Tuesday
w	Wednesday
h	Thursday
f	Friday
a/Sat	Saturday
occ:	occasional
DRM:	Digital Radio Mondiale
irreg	Irregular broadcasts
vl	Various languages
USB:	Upper Sideband

Choose the most promising frequencies for the time, location and conditions.

The frequencies ⑥ follow to the right of the station listing; all frequencies are listed in kilohertz (kHz). Not all listed stations will be heard from your location and virtually none of them will be heard all the time on all frequencies.

Shortwave broadcast stations change some of their frequencies at least twice a year, in April and October, to adapt to seasonal conditions. But they can also change in response to short-term conditions, interference, equipment prob-

lems, etc. Our frequency manager coordinates published station schedules with confirmations and reports from her monitoring team and MT readers to make the Shortwave Guide up-to-date as of one week before print deadline.

To help you find the most promising signal for your location, immediately following each frequency we've included information on the target area ⑦ of the broadcast. Signals beamed toward your area will generally be easier to hear than those beamed elsewhere, even though the latter will often still be audible.

Target Areas

af:	Africa
al:	alternate frequency (occasional use only)
am:	The Americas
as:	Asia
ca:	Central America
do:	domestic broadcast
eu:	Europe
me:	Middle East
na:	North America
pa:	Pacific
sa:	South America
va:	various

MT MONITORING TEAM

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Frequency Manager

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Thank You ...

Additional Contributors to This Month's Shortwave Guide:

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Shortwave Broadcast Bands

kHz	Meters
2300-2495	120 meters (Note 1)
3200-3400	90 meters (Note 1)
3900-3950	75 meters (Regional band, used for broadcasting in Asia only)
3950-4000	75 meters (Regional band, used for broadcasting in Asia and Europe)
4750-4995	60 meters (Note 1)
5005-5060	60 meters (Note 1)
5730-5900	49 meter NIB (Note 2)
5900-5950	49 meter WARC-92 band (Note 3)
5950-6200	49 meters
6200-6295	49 meter NIB (Note 2)
6890-6990	41 meter NIB (Note 2)
7100-7300	41 meters (Regional band, not allocated for broadcasting in the western hemisphere) (Note 4)
7300-7350	41 meter WARC-92 band (Note 3)
7350-7600	41 meter NIB (Note 2)
9250-9400	31 meter NIB (Note 2)
9400-9500	31 meter WARC-92 band (Note 3)
9500-9900	31 meters
11500-11600	25 meter NIB (Note 2)
11600-11650	25 meter WARC-92 band (Note 3)
11650-12050	25 meters
12050-12100	25 meter WARC-92 band (Note 3)
12100-12600	25 meter NIB (Note 2)
13570-13600	22 meter WARC-92 band (Note 3)
13600-13800	22 meters
13800-13870	22 meter WARC-92 band (Note 3)
15030-15100	19 meter NIB (Note 2)
15100-15600	19 meters
15600-15800	19 meter WARC-92 band (Note 3)
17480-17550	17 meter WARC-92 band (Note 3)
17550-17900	17 meters
18900-19020	15 meter WARC-92 band (Note 3)
21450-21850	13 meters
25670-26100	11 meters

Notes

- Note 1 Tropical bands, 120/90/60 meters are for broadcast use only in designated tropical areas of the world.
- Note 2 Broadcasters can use this frequency range on a (NIB) non-interference basis only.
- Note 3 WARC-92 bands are allocated officially for use by HF broadcasting stations in 2007.
- Note 4 WRC-03 update. After March 29, 2009, the spectrum from 7100-7200 kHz will no longer be available for broadcast purposes and will be turned over to amateur radio operations worldwide.

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0000 UTC - 7PM EST / 6PM CST / 4PM PST

0000 0020	Japan, NHK World/Radio Japan	5920eu
	6145na 13650as 17810as	
0000 0030	Australia, HCJB Global	15525as
0000 0030	Australia, Radio Australia	9660as 12080as
	13690as 15240pa 17715as 17750va	
	17775va 17795va	
0000 0030	Thailand, Radio	9680af
0000 0030	UK, BBC World Service	7340as 17615as
0000 0030	USA, Voice of America	7405af
0000 0045	India, All India Radio	9705as 9950as
	11620as 11645as 13605as	
0000 0057	Canada, Radio Canada Intl	9880as
0000 0057	Netherlands, Radio	6165na
0000 0100	Anguilla, University Network	6090am
0000 0100	Australia, ABC NT Alice Springs	2310do
	4835do	
0000 0100	Australia, ABC NT Katherine	5025do
0000 0100	Australia, ABC NT Tennant Creek	4910do
0000 0100	Bulgaria, Radio	7400na 9400na
0000 0100	Canada, CFRX Toronto ON	6070na
0000 0100	Canada, CFVP Calgary AB	6030na
0000 0100	Canada, CKZN St John's NF	6160na
0000 0100	Canada, CKZU Vancouver BC	6160na
0000 0100	China, China Radio Intl	6075as
	7130eu 7180as 9570na 11885as	
	13750as 15115as	
0000 0100	Costa Rica, University Network	5030va
	6150va 7375va 9725va	
0000 0100	Germany, Deutsche Welle	9785as 15595as
0000 0100	Guyana, Voice of 3291do	
0000 0100	Malaysia, RTM/Trax FM	7295as
0000 0100	New Zealand, Radio NZ Intl	15720pa
0000 0100	New Zealand, Radio NZ Intl	17675pa
0000 0100	Papua New Guinea, Wantok R. Light	7325va
0000 0100	Singapore, MediaCorp Radio	6150do
0000 0100	Spain, Radio Exterior Espana	6055na
0000 0100	UK, BBC World Service	6195as 9740as
	15335as 15360as	
0000 0100 f	UK, Bible Voice BC	6140as
0000 0100	USA, American Forces Radio	4319usb
	5446usb 5765usb 6350usb 7811usb	
	10320usb 12133usb 13362usb	
0000 0100	USA, KAIJ Dallas TX	5755va
0000 0100	USA, KTN Salt Lake City UT	7505na
	15590na	
0000 0100 twhf	USA, WBCQ Monticello ME	9330am
0000 0100	USA, WBOH Newport NC	5920am
0000 0100	USA, WEWN Vandiver AL	5810va
0000 0100	USA, WHRA Greenbush ME	5890eu
0000 0100	USA, WHRI Cypress Creek SC	7315am
0000 0100	USA, WINB Red Lion PA	9265am
0000 0100	USA, WRMI Miami FL	9955am
0000 0100	USA, WTJC Newport NC	9370na
0000 0100	USA, WWCN Nashville TN	3215na 7465na
	13845na	
0000 0100	USA, WWRB Manchester TN	3185va 5050va
	5745va 6890va	
0000 0100	USA, WYFR/Family Radio FL	6085na
	9505na 9715na 11720am	
0005 0100	Canada, Radio Canada Intl	9755am
0030 0045 Sun	Germany, Pan American BC	6165as
0030 0100	Australia, Radio Australia	9660as 12080as
	13690as 15240pa 15415as 17715as	
	17750va 17775va 17795va	
0030 0100	Lithuania, Radio Vilnius	11690na
0030 0100	Thailand, Radio	12095na
0030 0100 fas	UK, Bible Voice BC	6030as
0030 0100	USA, Voice of America	7200va 7405va
	9620va 11695va 11705va 11805va	
	12005va 15185va 15205va	
0035 0058 Sun/Mon	Austria, Radio Austria Intl	9870am
0043 0058 twhfa	Austria, Radio Austria Intl	9870am

0100 UTC - 8PM EST / 7PM CST / 5PM PST

0100 0105	Canada, Radio Canada Intl	9755am
0100 0127	Czech Rep, Radio Prague	6200na 7345na
0100 0128	Vietnam, Voice of	6175na
0100 0130	Australia, Radio Australia	9660as 12080as
	13690as 15240pa 15415as 17715as	
	17775va 17795va	
0100 0130	Slovakia, Radio Slovakia Int	7230na 9440sa
0100 0156	Romania, Radio Romania Intl	6145na

0100 0157	China, China Radio Intl	7130eu
0100 0157	Netherlands, Radio	6165na
0100 0159	Canada, Radio Canada Intl	5840va 7255va
0100 0200	Anguilla, University Network	6090am
0100 0200	Australia, ABC NT Katherine	5025do
0100 0200	Australia, ABC NT Tennant Creek	4910do
0100 0200	Canada, CFRX Toronto ON	6070na
0100 0200	Canada, CFVP Calgary AB	6030na
0100 0200	Canada, CKZN St John's NF	6160na
0100 0200	Canada, CKZU Vancouver BC	6160na
0100 0200	China, China Radio Intl	9535as 11870as
	15115as 15785as	
0100 0200	Costa Rica, University Network	5030va
	6150va 7375va 9725va	
0100 0200	Cuba, Radio Havana	6000na 6180na
0100 0200	Guyana, Voice of 3291do	
0100 0200	Indonesia, Voice of	9525al 11785pa
	15150as	
0100 0200	Malaysia, RTM/Trax FM	7295as
0100 0200	New Zealand, Radio NZ Intl	15720pa
0100 0200	New Zealand, Radio NZ Intl	17675pa
0100 0200	North Korea, Voice of Korea	7140as
	9345as 9730as 11735sa 15180sa	
0100 0200 vl	Papua New Guinea, Wantok R. Light	7325va
0100 0200	Singapore, MediaCorp Radio	6150do
0100 0200	Sri Lanka, SLBC	6005as 9770as
0100 0200	Taiwan, Radio Taiwan Intl	11875as
0100 0200	UK, BBC World Service	6195as 7320as
	11750as 15335as 15360as	
0100 0200 f	UK, Bible Voice BC	6140as
0100 0200	Ukraine, Radio Ukraine Intl	7530na
0100 0200	USA, American Forces Radio	4319usb
	5446usb 5765usb 6350usb 7811usb	
	10320usb 12133usb 13362usb	
0100 0200	USA, KAIJ Dallas TX	5755va
0100 0200	USA, KTN Salt Lake City UT	7505na
0100 0200	USA, KWHR Naalehu HI	17525as
0100 0200	USA, Voice of America	7200va 9865va
	11705va	
0100 0200 Sun	USA, WBCQ Monticello ME	9330am
0100 0200	USA, WBCQ Monticello ME	5110am 7415na
	9330na	
0100 0200	USA, WBOH Newport NC	5920am
0100 0200	USA, WEWN Vandiver AL	5810va
0100 0200	USA, WHRA Greenbush ME	5890eu
0100 0200 sm	USA, WHRI Cypress Creek SC	7315am
0100 0200	USA, WHRI Cypress Creek SC	7490va
0100 0200	USA, WINB Red Lion PA	9265am
0100 0200	USA, WRMI Miami FL	9955am
0100 0200	USA, WTJC Newport NC	9370na
0100 0200	USA, WWCN Nashville TN	3215na 5935na
	7465na	
0100 0200	USA, WWRB Manchester TN	3185va 5050va
	5745va 6890va	
0100 0200	USA, WWRB Manchester TN	3185va 5050va
	5745va 6890va	
0100 0200	USA, WYFR/Family Radio FL	6065na
	9505na 15195as	
0100 0200	Uzbekistan, CVC International	9480as
0105 0128 Sun/Mon	Austria, Radio Austria Intl	9870am
0105 0200 twhfa	Canada, Radio Canada Intl	9755am
0113 0128 twhfa	Austria, Radio Austria Intl	9870am
0130 0145 twhf	Albania, Radio Tirana	6110na
0130 0200	Australia, Radio Australia	9660as 12080as
	13690as 15240pa 15415as 17715as	
	17795va	
0130 0200	Iran, Voice of the Islamic Rep	6120na
	7160na	
0130 0200 twhfa	USA, Voice of America	5960va 7405va
0143 0158 twhfa	Austria, Radio Austria Intl	9870am

0200 UTC - 9PM EST / 8PM CST / 6PM PST

0200 0205 twhfa	Canada, Radio Canada Intl	9755am
0200 0215	Croatia, Voice of Croatia	7285na 9470eu
0200 0227	Czech Rep, Radio Prague	6200na 7345na
0200 0230	Iran, Voice of the Islamic Rep	6120na
	7160na	
0200 0230	South Korea, KBS World Radio	15575sa
0200 0230	Thailand, Radio	15275na
0200 0300	Anguilla, University Network	6090am
0200 0300 twhfa	Argentina, RAE	11710am
0200 0300	Australia, ABC NT Alice Springs	2310do
	4835do	
0200 0300	Australia, ABC NT Katherine	5025do

0200 0300	Australia, ABC NT Tennant Creek	4910do	
0200 0300	Australia, Radio Australia	9660as 12080as	
	13690as 15240pa	15415as	
	21725va		
0200 0300	Canada, CFRX Toronto ON	6070na	
0200 0300	Canada, CFVP Calgary AB	6030na	
0200 0300	Canada, CKZN St John's NF	6160na	
0200 0300	Canada, CKZU Vancouver BC	6160na	
0200 0300	China, China Radio Intl	11770as	13640as
0200 0300	Costa Rica, University Network	5030va	
	6150va 7375va	9725va	
0200 0300	Cuba, Radio Havana	6000na	6180na
0200 0300	Egypt, Radio Cairo	7270na	
0200 0300	Germany, Deutsche Welle	14665as	
0200 0300	Guyana, Voice of 3291do		
0200 0300	Malaysia, RTM/Trax FM	7295as	
0200 0300	New Zealand, Radio NZ Intl	15720pa	
0200 0300	New Zealand, Radio NZ Intl	17675pa	
0200 0300	North Korea, Voice of Korea	13650as	
	15100as		
0200 0300	Papua New Guinea, Wantok R. Light	7325va	
0200 0300	Philippines, Radio Pilipinas	12025va	15285va
	17770va		
0200 0300	Russia, Voice of	6140na 7250na	12040na
	13735na		
0200 0300	Singapore, MediaCorp Radio	6150do	
0200 0300	Sri Lanka, SLBC	6005as 9770as	15745as
0200 0300	Taiwan, Radio Taiwan Intl	5950na 9680na	
0200 0300	UK, BBC World Service	6030af 6195me	
	6195me 7320va	11750as	15360as
	17760as		
0200 0300	USA, American Forces Radio	4319usb	
	5446usb 5765usb	6350usb	7811usb
	10320usb	12133usb	13362usb
0200 0300	USA, KAIJ Dallas TX	5755va	
0200 0300	USA, KJES Vado NM	7555na	
0200 0300	USA, KJES Vado NM	7555na	
0200 0300	USA, KTBN Salt Lake City UT		7505na
0200 0300	USA, KWHR Naalehu HI	17525as	
0200 0300	USA, WBCQ Monticello ME	5110am	7415na
	9330na		
0200 0300	USA, WBCQ Monticello ME	9330am	
0200 0300	USA, WBOH Newport NC	5920am	
0200 0300	USA, WEWN Vandiver AL	5810va	
0200 0300	USA, WHRA Greenbush ME	5890eu	
0200 0300	USA, WHRI Cypress Creek SC		7490va
0200 0300	USA, WHRI Cypress Creek SC		5835na
0200 0300	USA, WHRI Cypress Creek SC		7315am
0200 0300	USA, WINB Red Lion PA	9265am	
0200 0300	USA, WRMI Miami FL	9955am	
0200 0300	USA, WRMI Miami FL	7385na	
0200 0300	USA, WTJC Newport NC	9370na	
0200 0300	USA, WWCR Nashville TN	3215na	5935na
	7465na		
0200 0300	USA, WWRB Manchester TN	3185va	5050va
	5745va 6890va		
0200 0300	USA, WYFR/Family Radio FL		5985am
	6065na 9505na	9525na	11855am
0200 0300	Uzbekistan, CVC International		9480as
0215 0230	Nepal, Radio	3230as 5005as	6100as
	7165as		
0230 0258	Vietnam, Voice of	6175na	
0230 0300	South Korea, KBS World Radio		9560na
0230 0300	Sweden, Radio	6010na 11550as	
0245 0300	Albania, Radio Tirana	7425na	
0245 0300	Myanmar, Myanma Radio	9730do	
0255 0300	Rwanda, Radio	6055do	

0300 UTC - 10PM EST / 9PM CST / 7PM PST

0300 0330	Egypt, Radio Cairo	7270na	
0300 0330	Myanmar, Myanma Radio	9730do	
0300 0330	Philippines, Radio Pilipinas	12025va	15285va
	17770va		
0300 0330	USA, KJES Vado NM	7555na	
0300 0330	USA, WBCQ Monticello ME	9330am	
0300 0400	Anguilla, University Network		6090am
0300 0400	Australia, ABC NT Alice Springs		2310do
	4835do		
0300 0400	Australia, ABC NT Katherine	5025do	
0300 0400	Australia, ABC NT Tennant Creek		4910do
0300 0400	Australia, Radio Australia	9660as 12080as	
	13690as 15240pa	15415as	15515as
	21725va		
0300 0400	Bulgaria, Radio	7400na 9400na	
0300 0400	Canada, CBC NQ SW Service		9625na

0300 0400	Canada, CFRX Toronto ON	6070na	
0300 0400	Canada, CFVP Calgary AB	6030na	
0300 0400	Canada, CKZN St John's NF	6160na	
0300 0400	Canada, CKZU Vancouver BC	6160na	
0300 0400	China, China Radio Intl	9690na	9790na
	11770as 13750as	15110as	15120as
	15785as		
0300 0400	Costa Rica, University Network		5030va
	6150va 7375va	9725va	
0300 0400	Cuba, Radio Havana	6000na	6180na
0300 0400	Germany, Deutsche Welle	9785as	13790as
0300 0400	Guyana, Voice of 3291do		
0300 0400	Malaysia, RTM/Trax FM	7295as	
0300 0400	Malaysia, RTM/Voice of Malaysia		6175as
	9750as 15295as		
0300 0400	New Zealand, Radio NZ Intl	15720pa	
0300 0400	New Zealand, Radio NZ Intl	17675pa	
0300 0400	North Korea, Voice of Korea		7140as
	9345as 9730as		
0300 0400	Oman, Radio Oman	15355as	
0300 0400	Papua New Guinea, Wantok R. Light		7325va
0300 0400	Russia, Voice of	6155na 6240na	7350na
	12040na 13735na		
0300 0400	Rwanda, Radio	6055do	
0300 0400	Singapore, MediaCorp Radio		6150do
0300 0400	South Africa, Channel Africa	3345af	7390as
0300 0400	Sri Lanka, SLBC	6005as 9770as	15745as
0300 0400	Taiwan, Radio Taiwan Intl	5950na	15215sa
	15320as		
0300 0400	UK, BBC World Service	3255af 6005af	
	6145af 6190af	6195me	7130af
	7160af 9510va	975-af	11760as
	15335as 15360as	21660as	
0300 0400	USA, American Forces Radio		4319usb
	5446usb 5765usb	6350usb	7811usb
	10320usb	12133usb	13362usb
0300 0400	USA, KAIJ Dallas TX	5755va	
0300 0400	USA, KTBN Salt Lake City UT		7505na
0300 0400	USA, KWHR Naalehu HI	17525as	
0300 0400	USA, Voice of America	4930af	6080af
	9885af 15580af		
0300 0400	USA, WBCQ Monticello ME	5110am	7415na
0300 0400	USA, WBOH Newport NC	5920am	
0300 0400	USA, WEWN Vandiver AL	5810va	
0300 0400	USA, WHRA Greenbush ME	5890eu	
0300 0400	USA, WHRI Cypress Creek SC		7490va
0300 0400	USA, WHRI Cypress Creek SC		5835na
0300 0400	USA, WHRI Cypress Creek SC		7315am
0300 0400	USA, WINB Red Lion PA	9265am	
0300 0400	USA, WRMI Miami FL	9955am	
0300 0400	USA, WRMI Miami FL	7385na	
0300 0400	USA, WTJC Newport NC	9370na	
0300 0400	USA, WWCR Nashville TN	3215na	5935na
	7465na		
0300 0400	USA, WWRB Manchester TN	3185va	5050va
	5745va 6890va		
0300 0400	USA, WYFR/Family Radio FL		6065na
	9505na		
0300 0400	Uzbekistan, CVC International		13685as
0330 0335	Bahrain, Radio Bahrain	6010as	
0330 0358	Vietnam, Voice of	6175sa	
0330 0400	Albania, Radio Tirana	6110na	
0330 0400	Sweden, Radio	6010na	
0330 0400	UK, BBC World Service	11665af	
0330 0400	USA, WBCQ Monticello ME	9330am	
0350 0400	Vatican City, Vatican Radio	6100am	7305am

0400 UTC - 11PM EST / 10PM CST / 8PM PST

0400 0420	Vatican City, Vatican Radio	6100am	7305am
0400 0427	Czech Rep, Radio Prague	5990na	6200na
	7345na		
0400 0430	Australia, Radio Australia	9660as 12080as	
	13690as 15240pa	15515as	21725va
0400 0430	France, Radio France Intl	7315af	9805af
0400 0430	Sri Lanka, SLBC	6005as 9770as	15745as
0400 0430	USA, Voice of America	4930af	4960af
	6080af 9885af	15580af	
0400 0430	USA, WWRB Manchester TN	3185va	
0400 0430	Vatican City, Vatican Radio	7360af	9660af
0400 0455	Turkey, Voice of	6020va 7240va	
0400 0456	Romania, Radio Romania Intl		6115va
	9515na 9690va	11895va	
0400 0458	New Zealand, Radio NZ Intl	15720pa	
0400 0458	New Zealand, Radio NZ Intl	17675pa	
0400 0459	South Africa, Channel Africa	3345af	

0400 0500	Anguilla, University Network	6090am	
0400 0500	Australia, ABC NT Alice Springs	2310do	
	4835do		
0400 0500	Australia, ABC NT Katherine	5025do	
0400 0500	Australia, ABC NT Tennant Creek	4910do	
0400 0500	Canada, CBC NQ SW Service	9625na	
0400 0500	Canada, CFRX Toronto ON	6070na	
0400 0500	Canada, CKZN St John's NF	6160na	
0400 0500	Canada, CKZU Vancouver BC	6160na	
0400 0500	China, China Radio Intl	6020na	6080as
	13750as	15120as	15785as
	17855as		17725as
0400 0500	Costa Rica, University Network	5030va	
	6150va	7375va	9725va
0400 0500	Cuba, Radio Havana	6000na	6180na
0400 0500	Germany, Deutsche Welle	5905af	5945af
	6180af	7225af	15455af
0400 0500	Guyana, Voice of 3291do		
0400 0500	Malaysia, RTM/Trax FM	7295as	
0400 0500	Malaysia, RTM/Voice of Malaysia	6175as	
	9750as	15295as	
0400 0500	Papua New Guinea, Wantok R. Light	7325va	
0400 0500	Russia, Voice of	6155na	6240na
	7350na	9550as	9840na
	12010na	12030na	12040na
	13580as	15455as	15530as
	17695as	17840as	15765as
0400 0500	Russia, Voice of	15735as	
0400 0500	Rwanda, Radio	6055do	
0400 0500	Singapore, MediaCorp Radio	6150do	
0400 0500	Uganda, Radio	4976do	5026do
0400 0500	UK, BBC World Service	3255af	6005af
	6190af	7120af	7160af
	11665af	12095af	15335as
	17760as	21660as	15360as
0400 0500	Ukraine, Radio Ukraine Intl	7530na	
0400 0500	USA, American Forces Radio	4319usb	
	5446usb	5765usb	6350usb
	10320usb	12133usb	13362usb
0400 0500	USA, KAIJ Dallas TX	5755va	
0400 0500	USA, KTN Salt Lake City UT	7505na	
0400 0500	USA, KWHR Naalehu HI	17525as	
0400 0500	USA, WBCQ Monticello ME	5110am	7415na
0400 0500	USA, WBOH Newport NC	5920am	
0400 0500	USA, WEWN Vandiver AL	5810va	
0400 0500	USA, WHRA Greenbush ME	5890eu	
0400 0500	USA, WHRI Cypress Creek SC	7490va	
0400 0500	USA, WHRI Cypress Creek SC	5835na	
0400 0500	USA, WHRI Cypress Creek SC	7315am	
0400 0500	USA, WMLK Bethel PA	9265va	
0400 0500	USA, WRMI Miami FL	9955am	
0400 0500	USA, WTJC Newport NC	9370na	
0400 0500	USA, WWCR Nashville TN	3215na	5890na
	5935na		
0400 0500	USA, WWRB Manchester TN	3185va	
0400 0500	USA, WYFR/Family Radio FL	6065na	
	6875na	7780va	9505na
0400 0500	Uzbekistan, CVC International	13685as	
0430 0445	Israel, Kol Israel	6280va	7545va
0430 0457	Czech Rep, Radio Prague	9890va	17600va
0430 0500	Albania, Radio Tirana	7425na	
0430 0500	Australia, Radio Australia	9660as	12080as
	13690as	15240pa	15415as
	21725va		15515va
0430 0500	Nigeria, Radio/Kaduna	6090do	
0430 0500	Swaziland, TWR 3200af	4775af	
0430 0500	USA, Voice of America	4930af	4960af
	9885af	15580af	
0459 0500	New Zealand, Radio NZ Intl	17675pa	
0459 0500	New Zealand, Radio NZ Intl	15720pa	

0500 UTC - 12AM EST / 11PM CST / 9PM PST

0500 0507	Canada, CBC NQ SW Service	9625na	
0500 0515	Sri Lanka, SLBC	6005as	15745as
0500 0530	Australia, Radio Australia	9660as	12080as
	13690as	15240pa	15515as
0500 0530	France, Radio France Intl	9805af	11995af
0500 0530	Germany, Deutsche Welle	7285af	9755af
	12045af	15410af	
0500 0530	Japan, NHK World/Radio Japan	5975eu	
	6110na	9725af	9875af
0500 0600	Anguilla, University Network	6090am	
0500 0600	Australia, ABC NT Alice Springs	2310do	
	4835do		
0500 0600	Australia, ABC NT Katherine	5025do	

0500 0600	Australia, ABC NT Tennant Creek	4910do	
0500 0600	Bhutan, BBS	6035as	
0500 0600	Canada, CFRX Toronto ON	6070na	
0500 0600	Canada, CKZN St John's NF	6160na	
0500 0600	Canada, CKZU Vancouver BC	6160na	
0500 0600	China, China Radio Intl	11710af	11880as
	15350as	15465as	17505as
	17725as	17855as	17540as
0500 0600	Costa Rica, University Network	5030va	
	6150va	7375va	9725va
0500 0600	Cuba, Radio Havana	6000na	6060na
	6180na	9550na	11760am
0500 0600	Germany, CVC Intl/Voice Africa	9430af	
0500 0600	Guyana, Voice of 3291do		
0500 0600	Malaysia, RTM/Trax FM	7295as	
0500 0600	Malaysia, RTM/Voice of Malaysia	6175as	
	9750as	15295as	
0500 0600	New Zealand, Radio NZ Intl	17675pa	
0500 0600	New Zealand, Radio NZ Intl	15720pa	
0500 0600	Nigeria, Radio/Kaduna	4770do	6090al
0500 0600	Papua New Guinea, Wantok R. Light	7325va	
0500 0600	Russia, Voice of	7150na	7350na
	9840na	12040na	12090as
	15455as	15530as	13580as
	17840as		17695as
0500 0600	Russia, Voice of	15735as	
0500 0600	Singapore, MediaCorp Radio	6150do	
0500 0600	South Africa, Channel Africa	7230af	9685af
0500 0600	Swaziland, TWR 3200af	4775af	9500af
0500 0600	Thailand, Radio	11730va	
0500 0600	Uganda, Radio	4976do	5026do
0500 0600	UK, BBC World Service	3255af	5875eu
	6005af	6190af	6195va
	9410va	11665af	11695as
	11955as	12095eu	15335as
	15420af	17640af	17760as
0500 0600	USA, American Forces Radio	4319usb	
	5446usb	5765usb	6350usb
	10320usb	12133usb	13362usb
0500 0600	USA, KAIJ Dallas TX	5755va	
0500 0600	USA, KTN Salt Lake City UT	7505na	
0500 0600	USA, KWHR Naalehu HI	11565as	15610as
0500 0600	USA, Voice of America	4930af	5855af
	6080af	9885af	15580af
0500 0600	USA, WBCQ Monticello ME	5110am	7415na
0500 0600	USA, WBOH Newport NC	5920am	
0500 0600	USA, WEWN Vandiver AL	5810va	
0500 0600	USA, WHRA Greenbush ME	7465va	
0500 0600	USA, WHRI Cypress Creek SC	7490va	
0500 0600	USA, WHRI Cypress Creek SC	5835na	
0500 0600	USA, WMLK Bethel PA	9265va	
0500 0600	USA, WRMI Miami FL	9955am	
0500 0600	USA, WTJC Newport NC	9370na	
0500 0600	USA, WWCR Nashville TN	3215na	5890na
	5935na		
0500 0600	USA, WWRB Manchester TN	3185va	
0500 0600	USA, WYFR/Family Radio FL	6875na	
	7520va		
0500 0600	Uzbekistan, CVC International	13685as	
0500 0600	Zambia, CVC International	6065af	
0505 0520	Austria, Radio Austria Intl	17870me	
0505 0530	Austria, Radio Austria Intl	17870me	
0515 0530	Rwanda, Radio	6055do	
0530 0600	Australia, Radio Australia	9660as	12080as
	13690as	15240pa	15415as
0530 0600	Rwanda, Radio	6055do	
0535 0600	Austria, Radio Austria Intl	17870me	
0545 0600	Austria, Radio Austria Intl	17870me	
0545 0600	UK, Sudan Radio Service	15400af	

0600 UTC - 1AM EST / 12AM CST / 10PM PST

0600 0600	USA, WHRI Cypress Creek SC	7315am	
0600 0605	Croatia, Voice of Croatia	11690pa	
0600 0615	South Africa, TWR	11640af	
0600 0615	UK, Sudan Radio Service	15400af	
0600 0630	Australia, Radio Australia	9660as	12080as
	13690as	15240pa	
0600 0630	Australia, Radio Australia	15290va	15415va
	15515va		
0600 0630	France, Radio France Intl	7315af	11995af
	13680af		
0600 0630	Germany, Deutsche Welle	5945af	7240af
	12045af		
0600 0630	Nigeria, Radio, Natl Svc/Abuja	7275do	
0600 0630	Vatican City, Vatican Radio	7360af	9660af

0600 0645	mtwhf	11625af	
0600 0657		South Africa, TWR	11640af
0600 0658		China, China Radio Intl	6115na
0600 0658	DRM	New Zealand, Radio NZ Intl	17675pa
0600 0700		New Zealand, Radio NZ Intl	15720pa
0600 0700		Anguilla, University Network	6090am
0600 0700		Australia, ABC NT Alice Springs	2310do
0600 0700		4835do	
0600 0700		Australia, ABC NT Katherine	5025do
0600 0700		Australia, ABC NT Tennant Creek	4910do
0600 0700		Australia, CVC International	15360as
0600 0700		Bhutan, BBS	6035as
0600 0700		Canada, CFRX Toronto ON	6070na
0600 0700		Canada, CFVP Calgary AB	6030na
0600 0700		Canada, CKZN St John's NF	6160na
0600 0700		Canada, CKZU Vancouver BC	6160na
0600 0700		China, China Radio Intl	11870as
0600 0700		13660as	15140as
0600 0700		17505as	15350as
0600 0700		17540as	15465as
0600 0700		17710as	
0600 0700		Costa Rica, University Network	5030va
0600 0700		6150va	7375va
0600 0700		7375va	11870va
0600 0700		Cuba, Radio Havana	6000na
0600 0700		6180na	9550na
0600 0700		9550na	11760na
0600 0700		Germany, CVC Intl/Voice Africa	11720af
0600 0700		Guyana, Voice of 3291do	
0600 0700		Malaysia, RTM/Trax FM	7295as
0600 0700		Malaysia, RTM/Voice of Malaysia	6175as
0600 0700		9750as	15295as
0600 0700		Nigeria, Radio/Kaduna	4770do
0600 0700	vl	Papua New Guinea, Wantok R. Light	7325va
0600 0700		Russia, Voice of 9550as	13580as
0600 0700		17665pa	17805pa
0600 0700		Singapore, MediaCorp Radio	6150do
0600 0700	vl	Solomon Islands, SIBC	5020do
0600 0700		5020do	9545al
0600 0700		South Africa, Channel Africa	7230af
0600 0700		7230af	15255af
0600 0700		Swaziland, TWR	3200af
0600 0700		3200af	4775af
0600 0700		4775af	9500af
0600 0700		UK, BBC World Service	6005af
0600 0700		6005af	6190af
0600 0700		7160af	9410va
0600 0700		9410va	9825af
0600 0700		9825af	11760va
0600 0700		11765af	11940af
0600 0700		11940af	11955as
0600 0700		11955as	15335as
0600 0700		15360as	15420af
0600 0700		15420af	17640af
0600 0700		17640af	17760as
0600 0700		21660as	
0600 0700		Ukraine, Radio Ukraine Intl	7440eu
0600 0700		USA, American Forces Radio	4319usb
0600 0700		5446usb	5765usb
0600 0700		5765usb	6350usb
0600 0700		6350usb	7811usb
0600 0700		10320usb	12133usb
0600 0700		12133usb	13362usb
0600 0700		USA, KAIJ Dallas TX	5755va
0600 0700		USA, KBTN Salt Lake City UT	7505na
0600 0700		USA, KWHR Naalehu HI	11565as
0600 0700		11565as	15610as
0600 0700		USA, Voice of America	6080af
0600 0700		6080af	9885af
0600 0700		15580af	
0600 0700		USA, WBCQ Monticello ME	5110am
0600 0700		5110am	7415na
0600 0700		USA, WBOH Newport NC	5920am
0600 0700		5920am	
0600 0700		USA, WEWN Vandiver AL	5810va
0600 0700		5810va	7465va
0600 0700		USA, WHRA Greenbush ME	7465va
0600 0700		7465va	5835va
0600 0700		USA, WHRI Cypress Creek SC	5835va
0600 0700		7315am	
0600 0700		USA, WMLK Bethel PA	9265va
0600 0700		9265va	
0600 0700		USA, WRMI Miami FL	9955am
0600 0700		9955am	
0600 0700		USA, WTJC Newport NC	9370na
0600 0700		9370na	
0600 0700		USA, WWCR Nashville TN	3215na
0600 0700		3215na	5070na
0600 0700		5890na	5935na
0600 0700		5935na	
0600 0700		USA, WWRB Manchester TN	3185va
0600 0700		3185va	
0600 0700		USA, WYFR/Family Radio FL	5745va
0600 0700		6000am	9860na
0600 0700		9860na	11530va
0600 0700	vl	Vanuatu, Radio	4960do
0600 0700		4960do	
0600 0700		Yemen, Rep of Yemen Radio	9780me
0600 0700		9780me	6065af
0600 0700		Zambia, CVC International	6065af
0630 0700		Australia, Radio Australia	9660as
0630 0700		9660as	12080as
0630 0700		13690as	15240pa
0630 0700		15240pa	15415as
0630 0700		15415as	15515as
0630 0700		Romania, Radio Romania Intl	7180va
0630 0700		9690va	15135va
0630 0700		15135va	17780va
0630 0700		UK, Sudan Radio Service	15675af
0659 0700	mwf	New Zealand, Radio NZ Intl	9765pa
0659 0700	DRM	New Zealand, Radio NZ Intl	9870pa

0700 UTC - 2AM EST / 1AM CST / 11PM PST

0700 0706		UK, BBC World Service	6005af
0700 0730		France, Radio France Intl	11725af
0700 0730		Slovakia, Radio Slovakia Int	13715pa
0700 0730		13715pa	15460pa
0700 0730		UK, BBC World Service	15575va
0700 0730		Vatican City, Vatican Radio	5965eu
0700 0730		5965eu	7250eu
0700 0800		Anguilla, University Network	6090am
0700 0800		Australia, ABC NT Alice Springs	2310do
0700 0800		4835do	
0700 0800		Australia, ABC NT Katherine	5025do

0700 0800		Australia, ABC NT Tennant Creek	4910do
0700 0800		Australia, CVC International	15360as
0700 0800		Australia, Radio Australia	9660as
0700 0800		12080as	13630as
0700 0800		13630as	15240pa
0700 0800		15240pa	15415as
0700 0800		Bhutan, BBS	6035as
0700 0800		Canada, CFRX Toronto ON	6070na
0700 0800		Canada, CFVP Calgary AB	6030na
0700 0800		Canada, CKZN St John's NF	6160na
0700 0800		Canada, CKZU Vancouver BC	6160na
0700 0800		China, China Radio Intl	11785eu
0700 0800		11785eu	11880as
0700 0800		13660as	15350as
0700 0800		15350as	15465as
0700 0800		17540as	17710as
0700 0800		Costa Rica, University Network	5030va
0700 0800		6150va	7375va
0700 0800		7375va	9725va
0700 0800		9725va	11870va
0700 0800		Germany, CVC Intl/Voice Africa	15640af
0700 0800		Greece, Voice of 7475va	9420va
0700 0800		9420va	12105va
0700 0800		Guyana, Voice of 3291do	5950do
0700 0800	Sat	Latvia, Radio SWH	9290eu
0700 0800		Liberia, Star Radio	9525af
0700 0800		Malaysia, RTM/Trax FM	7295as
0700 0800		Malaysia, RTM/Voice of Malaysia	6175as
0700 0800		9750as	15295as
0700 0800		Myanmar, Myanma Radio	9730do
0700 0800		New Zealand, Radio NZ Intl	9765pa
0700 0800	DRM	New Zealand, Radio NZ Intl	9870pa
0700 0800		Nigeria, Radio/Kaduna	4770do
0700 0800		4770do	6090al
0700 0800	vl	Papua New Guinea, Wantok R. Light	7325va
0700 0800		Russia, Voice of 9550as	13580as
0700 0800		Russia, Voice of 11615eu	11635eu
0700 0800	DRM	Singapore, MediaCorp Radio	6150do
0700 0800		Solomon Islands, SIBC	5020do
0700 0800	vl	South Africa, Channel Africa	9625af
0700 0800		9625af	9545al
0700 0800		Swaziland, TWR	4775af
0700 0800		4775af	9500af
0700 0800		Taiwan, Radio Taiwan Intl	5950na
0700 0800		UK, BBC World Service	6190af
0700 0800		6190af	6195va
0700 0800		9410va	11760me
0700 0800		11760me	11765af
0700 0800		11955as	12095va
0700 0800		12095va	13620af
0700 0800		13620af	15360as
0700 0800		15400af	15420af
0700 0800		15420af	17760as
0700 0800		USA, American Forces Radio	4319usb
0700 0800		5446usb	5765usb
0700 0800		5765usb	6350usb
0700 0800		6350usb	7811usb
0700 0800		10320usb	12133usb
0700 0800		12133usb	13362usb
0700 0800		USA, KAIJ Dallas TX	5755va
0700 0800		USA, KBTN Salt Lake City UT	7505na
0700 0800		USA, KWHR Naalehu HI	11565as
0700 0800		11565as	15610as
0700 0800		USA, WBCQ Monticello ME	5110am
0700 0800		5110am	7415na
0700 0800		USA, WBOH Newport NC	5920am
0700 0800		5920am	
0700 0800		USA, WEWN Vandiver AL	5810va
0700 0800		5810va	
0700 0800		USA, WHRI Cypress Creek SC	5835va
0700 0800		7315am	
0700 0800		USA, WMLK Bethel PA	9265va
0700 0800		9265va	
0700 0800		USA, WRMI Miami FL	9955am
0700 0800		9955am	
0700 0800		USA, WTJC Newport NC	9370na
0700 0800		9370na	
0700 0800		USA, WWCR Nashville TN	3215na
0700 0800		3215na	5070na
0700 0800		5890na	5935na
0700 0800		5935na	
0700 0800		USA, WWRB Manchester TN	3185va
0700 0800		3185va	
0700 0800		USA, WYFR/Family Radio FL	5745va
0700 0800		6000am	9860na
0700 0800		9860na	11530va
0700 0800	vl	Vanuatu, Radio	4960do
0700 0800		4960do	
0700 0800		Zambia, CVC International	6065af
0700 0800		Australia, HCJB Global	11750pa
0730 0800		11750pa	
0730 0800		Bulgaria, Radio	7400eu
0730 0800		7400eu	9400eu
0730 0800		Pakistan, Radio	15100eu
0730 0800		15100eu	17835eu
0730 0800	Sat/Sun	UK, BBC World Service	15575va
0730 0800		Vatican City, Vatican Radio	7360af
0730 0800		7360af	9660af
0730 0800		11625af	
0745 0800	mtwhfa	Australia, HCJB Global	11750pa
0745 0800	Sun	Germany, TWR Europe	6105eu
0745 0800	Sun	Monaco, TWR Europe	9800eu

0800 UTC - 3AM EST / 2AM CST / 12AM PST

0800 0825		Malaysia, RTM/Voice of Malaysia	6175as
0800 0825		9750as	15295as
0800 0827		Czech Rep, Radio Prague	7345eu
0800 0830		Australia, ABC NT Katherine	5025do
0800 0830		Australia, ABC NT Tennant Creek	4910do
0800 0830		Myanmar, Myanma Radio	9730do
0800 0830		Pakistan, Radio	15100eu
0800 0830		15100eu	17835eu
0800 0845	Sat	Guam, TWR/KTWR	11840pa
0800 0850	mtwhf	Germany, TWR Europe	6105eu
0800 0850	mtwhf	Monaco, TWR Europe	9800eu
0800 0857		China, China Radio Intl	11785eu
0800 0900		11785eu	17490eu
0800 0900		Anguilla, University Network	6090am
0800 0900		Australia, ABC NT Alice Springs	2310do
0800 0900		4835do	
0800 0900		Australia, CVC International	15360as

0800 0900	Australia, HCJB Global	11750pa	
0800 0900	Australia, Radio Australia	9580va	9590va
	9710as	12080va	15415as
0800 0900	Canada, CFRX Toronto ON	6070na	
0800 0900	Canada, CFVP Calgary AB	6030na	
0800 0900	Canada, CKZN St John's NF	6160na	
0800 0900	Canada, CKZU Vancouver BC	6160na	
0800 0900	China, China Radio Intl	11620as	11880as
	15350as	15465as	17540as
0800 0900	Costa Rica, University Network	5030va	
	6150va	7375va	9725va
0800 0900	Germany, CVC Intl/Voice Africa	11870va	15640af
0800 0900 DRM	Germany, Deutsche Welle	12005as	
0800 0900 Sun	Germany, TWR Europe	6105eu	
0800 0900 mtwhf	Guam, TWR/KTWR	11840pa	
0800 0900	Guyana, Voice of 3291do	5950do	
0800 0900	Indonesia, Voice of	9525al	11785pa
	15150as		
0800 0900	Malaysia, RTM/Trax FM	7295as	
0800 0900 Sun	Monaco, TWR Europe	9800eu	
0800 0900	New Zealand, Radio NZ Intl	9765pa	
0800 0900 DRM	New Zealand, Radio NZ Intl	9870pa	
0800 0900	Nigeria, Radio/Kaduna	4770do	6090al
0800 0900	Nigeria, Voice of/Ext. Svc Lagos	9690af	
0800 0900	Papua New Guinea, NBC	4890do	
0800 0900 vl	Papua New Guinea, Wantok R. Light	7325va	
0800 0900	Russia, Voice of 9550as	13580as	13660as
	15195as	17495pa	17665pa
0800 0900 DRM	Russia, Voice of 11615eu		
0800 0900	Singapore, MediaCorp Radio	6150do	
0800 0900 vl	Solomon Islands, SIBC	5020do	9545al
0800 0900 vl	South Africa, Channel Africa	9625af	
0800 0900 Sun	South Africa, DX Amateur League	7205af	
	17570af		
0800 0900	South Korea, KBS World Radio	9570as	
0800 0900	Swaziland, TWR 4775af	6120af	9500af
0800 0900	UK, BBC World Service	6190af	6195as
	9740as	11760me	11940af
	15285as	15400af	17640af
	17830af	21470af	21660as
0800 0900 Sat/Sun	UK, BBC World Service	15575va	
0800 0900 fas	UK, Bible Voice BC	5945eu	
0800 0900	USA, American Forces Radio	4319usb	
	5446usb	5765usb	6350usb
	10320usb	12133usb	13362usb
0800 0900	USA, KAIJ Dallas TX	5755va	
0800 0900	USA, KNLS Anchor Point AK	9615as	
0800 0900	USA, KTNB Salt Lake City UT	7505na	
0800 0900	USA, KWHR Naalehu HI	9930as	11565as
0800 0900	USA, WBOH Newport NC	5920am	
0800 0900	USA, WHRI Cypress Creek SC	5835va	
	7315am		
0800 0900	USA, WMLK Bethel PA	9265va	
0800 0900	USA, WRMI Miami FL	9955am	
0800 0900	USA, WTJC Newport NC	9370na	
0800 0900	USA, WWCR Nashville TN	3215na	5070na
	5890na	5935na	
0800 0900	USA, WWRB Manchester TN	3185va	
0800 0900	USA, WYFR/Family Radio FL	5950na	
	6875na	7455na	9985af
0800 0900 vl	Vanuatu, Radio	4960do	
0800 0900	Zambia, CVC International	6065af	
0805 0900 twhf	Guam, TWR/KTWR	15170as	
0815 0850 Sat	Germany, TWR Europe	6105eu	
0815 0850 Sat	Monaco, TWR Europe	9800eu	
0830 0900	Australia, ABC NT Katherine	2485do	
0830 0900	Australia, ABC NT Tennant Creek	2325do	
0830 0900 Mon	Guam, TWR/KTWR	15170as	
0830 0900	Lithuania, Radio Vilnius	9710eu	

0900 UTC - 4AM EST / 3AM CST / 1AM PST

0900 0900	USA, WBCQ Monticello ME	5110am	7415na
0900 0915 Sat	UK, Bible Voice BC	5945eu	
0900 0920 Sun	Germany, TWR Europe	6105eu	
0900 0920 Sun	Monaco, TWR Europe	9800eu	
0900 0930	Australia, HCJB Global	11750pa	
0900 0930	Japan, NHK World/Radio Japan	9825as	
	11815as	12000pa	15590as
0900 0945 Sun	UK, Bible Voice BC	5945eu	
0900 0957	China, China Radio Intl	15270eu	17490eu
	17570eu		
0900 1000	Anguilla, University Network	6090am	
0900 1000	Australia, ABC NT Alice Springs	2310do	
	4835do		
0900 1000	Australia, ABC NT Katherine	2485do	

0900 1000	Australia, ABC NT Tennant Creek	2325do	
0900 1000	Australia, CVC International	15360as	
0900 1000	Australia, Radio Australia	9580va	9590va
	11880as	15415as	
0900 1000	Bhutan, BBS	6035as	
0900 1000	Canada, CFRX Toronto ON	6070na	
0900 1000	Canada, CFVP Calgary AB	6030na	
0900 1000	Canada, CKZN St John's NF	6160na	
0900 1000	Canada, CKZU Vancouver BC	6160na	
0900 1000	China, China Radio Intl	11620as	15210pa
	15535as	17690pa	17750as
0900 1000	Costa Rica, University Network	5030va	
	6150va	7375va	9725va
	13750va		
0900 1000 DRM	Germany, CVC Intl/Voice Africa	7120as	
0900 1000	Germany, Deutsche Welle	17710as	21840as
0900 1000	Guyana, Voice of 3291do	5950do	
0900 1000	Malaysia, RTM/Trax FM	7295as	
0900 1000	New Zealand, Radio NZ Intl	9765pa	
0900 1000 DRM	New Zealand, Radio NZ Intl	9870pa	
0900 1000	Nigeria, Radio/Kaduna	4770do	6090al
0900 1000	Nigeria, Voice of/Ext. Svc Lagos	9690af	
0900 1000	Papua New Guinea, NBC	4890do	
0900 1000 vl	Papua New Guinea, Wantok R. Light	7325va	
0900 1000	Russia, Voice of 9550as	13580as	13660as
	15195as	17495pa	17665pa
0900 1000 DRM	Russia, Voice of 11615eu		
0900 1000	Saudi Arabia, BSKSA	15250af	
0900 1000	Singapore, MediaCorp Radio	6150do	
0900 1000 vl	Solomon Islands, SIBC	5020do	9545al
0900 1000 vl	South Africa, Channel Africa	9625af	
0900 1000	UK, BBC World Service	6190af	6195as
	9740as	11760me	11895as
	12095va	15285as	15400af
	17640af	17760as	17830af
	21660as		
0900 1000	USA, American Forces Radio	4319usb	
	5446usb	5765usb	6350usb
	10320usb	12133usb	13362usb
0900 1000	USA, KAIJ Dallas TX	5755va	
0900 1000	USA, KTNB Salt Lake City UT	7505na	
0900 1000	USA, KWHR Naalehu HI	9930as	11565as
0900 1000	USA, WBCQ Monticello ME	5110am	7415na
0900 1000	USA, WBOH Newport NC	5920am	
0900 1000	USA, WHRI Cypress Creek SC	5835va	
	7315am		
0900 1000	USA, WRMI Miami FL	9955am	
0900 1000	USA, WTJC Newport NC	9370na	
0900 1000	USA, WWCR Nashville TN	3215na	5070na
	5890na	5935na	
0900 1000	USA, WWRB Manchester TN	3185va	
0900 1000	USA, WYFR/Family Radio FL	5950na	
	6875na	9460as	9465as
0900 1000 vl	Vanuatu, Radio	4960do	
0900 1000	Zambia, CVC International	6065af	
0915 0945 Sat	UK, Bible Voice BC	5945eu	
0930 1000	Mongolia, Voice of	12085va	

1000 UTC - 5AM EST / 4AM CST / 2AM PST

1000 1027	Czech Rep, Radio Prague	9955na	15710as
	21745af		
1000 1030	Mongolia, Voice of	12085va	
1000 1030	UK, BBC World Service	15285as	17760as
1000 1057	Netherlands, Radio	6040as	9795as
	12065as		
1000 1058	New Zealand, Radio NZ Intl	9765pa	
1000 1100	Anguilla, University Network	11775am	
1000 1100	Australia, ABC NT Alice Springs	2310do	
	4835do		
1000 1100	Australia, ABC NT Katherine	2485do	
1000 1100	Australia, ABC NT Tennant Creek	2325do	
1000 1100	Australia, CVC International	15270as	
1000 1100	Australia, Radio Australia	9580va	9590va
	11880as	12080va	15415as
1000 1100 DRM	Austria, CVC International	11815eu	
1000 1100	Canada, CFRX Toronto ON	6070na	
1000 1100	Canada, CFVP Calgary AB	6030na	
1000 1100	Canada, CKZN St John's NF	6160na	
1000 1100	Canada, CKZU Vancouver BC	6160na	
1000 1100	China, China Radio Intl	5995as	6040na
	11610as	11635as	11650as
	13590as	13620as	13720as
	15210as	15350as	17490eu
1000 1100	Costa Rica, University Network	5030va	
	6150va	7375va	9725va
			11870va

1000 1100	DRM	13750va		
1000 1100		Germany, CVC Intl/Voice Africa	7120as	
1000 1100		Guyana, Voice of 3291do	5950do	
1000 1100		India, All India Radio	7270as	13710pa
		15020as	15235as	15260as
		17800as	17895pa	17510pa
1000 1100		Malaysia, RTM/Trax FM	7295as	
1000 1100	DRM	New Zealand, Radio NZ Intl	9870pa	
1000 1100		Nigeria, Radio/Kaduna	4770do	6090al
1000 1100		Nigeria, Voice of/ Ext. Svc Lagos	9690af	
1000 1100		North Korea, Voice of Korea	6185as	
		6285sa	9325sa	9850as
1000 1100		Papua New Guinea, NBC	4890do	
1000 1100	vl	Papua New Guinea, Wantok R. Light	7325va	
1000 1100		Saudi Arabia, BSKSA	15250af	
1000 1100		Singapore, MediaCorp Radio	6150do	
1000 1100	Sun	Slovakia, European Gospel Radio	9510va	
1000 1100	vl	Solomon Islands, SIBC	5020do	9545al
1000 1100	vl	South Africa, Channel Africa	9625af	
1000 1100		UK, BBC World Service	6190af	6195as
		9740as	11760me	11895as
		15575va	17640af	21470af
1000 1100	Sat/Sun	UK, BBC World Service	15400af	17830af
1000 1100		Ukraine, Radio Ukraine Intl	9950eu	
1000 1100		USA, American Forces Radio	4319usb	
		5446usb	5765usb	6350usb
		10320usb	12133usb	13362usb
1000 1100		USA, KAIJ Dallas TX	5755va	
1000 1100		USA, KNLS Anchor Point AK	6150as	
1000 1100		USA, KTNB Salt Lake City UT	7505na	
1000 1100		USA, KWHR Naalehu HI	9930as	11565
		as		
1000 1100		USA, WBCQ Monticello ME	5110am	7415na
1000 1100		USA, WBOH Newport NC	5920am	
1000 1100		USA, WHRI Cypress Creek SC	9865am	5835va
		9865am		
1000 1100		USA, WRMI Miami FL	9955am	
1000 1100		USA, WTJC Newport NC	9370na	
1000 1100		USA, WWCN Nashville TN	5070na	5890na
		5935na	9985na	
1000 1100		USA, WWRB Manchester TN	3185va	
1000 1100		USA, WYFR/Family Radio FL	5950na	
		6000am	6875na	6890na
		9460as	11725am	11830am
1000 1100		Zambia, CVC International	6065af	
1015 1045	Sun	UK, Bible Voice BC	5985as	
1030 1045		Israel, Kol Israel	13855va	15760va
1030 1058		Vietnam, Voice of	7285as	
1030 1100		Iran, Voice of the Islamic Rep	17660as	15460as
1059 1100		New Zealand, Radio NZ Intl	13840pa	

1100 UTC - 6AM EST / 5AM CST / 3AM PST

1100 1128		Vietnam, Voice of	9840as	7220as
		7285as		
1100 1130		Iran, Voice of the Islamic Rep	15460as	
		17600as		
1100 1130		UK, BBC World Service	15400af	
1100 1200		Anguilla, University Network	11775am	
1100 1200		Australia, ABC NT Alice Springs	2310do	
		4835do		
1100 1200		Australia, ABC NT Katherine	2485do	
1100 1200		Australia, ABC NT Tennant Creek	2325do	
1100 1200		Australia, CVC International	13635as	
1100 1200	DRM	Australia, Radio Australia	12080va	
1100 1200		Australia, Radio Australia	5995va	6020va
		9475as	9560pa	9580va
		11880va		9590va
1100 1200	Sat/Sun	Canada, CBC NQ SW Service	9625na	
1100 1200		Canada, CFRX Toronto ON	6070na	
1100 1200		Canada, CFVP Calgary AB	6030na	
1100 1200		Canada, CKZN St John's NF	6160na	
1100 1200		Canada, CKZU Vancouver BC	6160na	
1100 1200		China, China Radio Intl	6040na	11750na
		13655eu	17490eu	
1100 1200		Costa Rica, University Network	5030va	
		6150va	7375va	9725va
		13750va		11870va
1100 1200	DRM	Germany, CVC Intl/Voice Africa	7120as	
1100 1200		Malaysia, RTM/Trax FM	7295as	
1100 1200	DRM	New Zealand, Radio NZ Intl	9870pa	
1100 1200		New Zealand, Radio NZ Intl	13840pa	
1100 1200		Nigeria, Radio/Kaduna	4770do	6090al
1100 1200		Nigeria, Voice of/ Ext. Svc Lagos	9690af	
1100 1200		Papua New Guinea, NBC	4890do	

1100 1200	vl	Papua New Guinea, Wantok R. Light	7325va	
1100 1200		Saudi Arabia, BSKSA	15250af	
1100 1200		Singapore, Radio Singapore Intl	6080as	
		6150as		
1100 1200	Sun	Slovakia, European Gospel Radio	9510va	
1100 1200	vl	South Africa, Channel Africa	9625af	
1100 1200		Taiwan, Radio Taiwan Intl	7445as	
1100 1200		UK, BBC World Service	5875am	6190af
		6195as	9660am	9740as
		11760me	11895as	11940af
		17640af	17830af	21470af
1100 1200	Sat	UK, Bible Voice BC	5950as	
1100 1200		USA, American Forces Radio	4319usb	
		5446usb	5765usb	6350usb
		10320usb	12133usb	13362usb
1100 1200		USA, KAIJ Dallas TX	5755va	
1100 1200		USA, KTNB Salt Lake City UT	7505na	
1100 1200		USA, KWHR Naalehu HI	9930as	
1100 1200		USA, WBOH Newport NC	5920am	
1100 1200		USA, WHRI Cypress Creek SC	5875va	
		7315na		
1100 1200		USA, WINB Red Lion PA	9265am	
1100 1200		USA, WRMI Miami FL	9955am	
1100 1200		USA, WTJC Newport NC	9370na	
1100 1200		USA, WWCN Nashville TN	5070na	5890na
		5935na	15825na	
1100 1200		USA, WWRB Manchester TN	3185va	
1100 1200		USA, WYFR/Family Radio FL	5950na	
		6890na	7780na	
1100 1200		Zambia, CVC International	6065af	
1115 1130	mtwhf	UK, Bible Voice BC	5950as	
1115 1200	Sun	UK, Bible Voice BC	5950as	
1120 1157		Czech Rep, Radio Prague	11640eu	
		175451euva		
1130 1200		Greece, Voice of 9420va	15650va	
1130 1200		Guam, AWR/KSDA	15260as	
1130 1200		Micronesia, PMA/The Cross	4755as	

1200 UTC - 7AM EST / 6AM CST / 4AM PST

1200 1215	f	UK, Bible Voice BC	5950as	
1200 1227		Netherlands, Radio	11675na	
1200 1230		Australia, HCJB Global	15400as	
1200 1230		France, Radio France Intl	21620af	
1200 1230		Germany, AWR Europe	15495as	
1200 1230		Japan, NHK World/Radio Japan	6120na	
		9625pa	13660as	17585eu
1200 1230	Sun	UK, Bible Voice BC	5945eu	
1200 1257		China, China Radio Intl	13655eu	13790eu
		17490eu		
1200 1257	DRM/ mtwhf	Netherlands, Radio	5955eu	
1200 1258		New Zealand, Radio NZ Intl	13840pa	
1200 1258	DRM	New Zealand, Radio NZ Intl	9870pa	
1200 1300		Anguilla, University Network	11775am	
1200 1300		Australia, ABC NT Alice Springs	2310do	
		4835do		
1200 1300		Australia, ABC NT Katherine	2485do	
1200 1300		Australia, ABC NT Tennant Creek	2325do	
1200 1300		Australia, CVC International	13635as	
1200 1300		Australia, Radio Australia	5995va	6020va
		9475as	9560pa	9580va
		11880va		9590va
1200 1300	Sat/Sun	Canada, CBC NQ SW Service	9625na	
1200 1300		Canada, CFRX Toronto ON	6070na	
1200 1300		Canada, CFVP Calgary AB	6030na	
1200 1300		Canada, CKZN St John's NF	6160na	
1200 1300		Canada, CKZU Vancouver BC	6160na	
1200 1300		China, China Radio Intl	6040na	11750na
		13655eu	17490eu	
1200 1300		Costa Rica, University Network	5030va	
		6150va	7375va	9725va
		13750va		11870va
1200 1300	Sun	Latvia, Radio SWH	9290eu	
1200 1300		Malaysia, RTM/Trax FM	7295as	
1200 1300		Nigeria, Radio/Kaduna	4770do	6090al
1200 1300		Nigeria, Voice of/ Ext. Svc Lagos	9690af	
1200 1300		Papua New Guinea, NBC	4890do	
1200 1300	vl	Papua New Guinea, Wantok R. Light	7325va	
1200 1300		Singapore, Radio Singapore Intl	6080as	
		6150as		
1200 1300	Sun	Slovakia, European Gospel Radio	9510va	
1200 1300		South Korea, KBS World Radio	9650na	
1200 1300	DRM/ Fri	Taiwan, Radio Taiwan Intl	9750eu	
1200 1300		UK, BBC World Service	5975as	6190af
		6195as	9660am	9740as
		11760me	11895as	11940af
				15575va

1200 1300	17640af	17830af	21470af
1200 1300	Ukraine, Radio Ukraine Intl	9950eu	
	USA, American Forces Radio	4319usb	
	5446usb	5765usb	6350usb
	10320usb	12133usb	13362usb
1200 1300	USA, KAIJ Dallas TX	9480va	
1200 1300	USA, KNLS Anchor Point AK	6150as	6915as
1200 1300	USA, KTBN Salt Lake City UT		7505na
1200 1300	USA, KWHR Naalehu HI	12130as	
1200 1300	USA, Voice of America	9640va	9760va
	11705va	11730va	15190va
1200 1300	USA, WBOH Newport NC	5920am	
1200 1300	USA, WHRA Greenbush ME	13650va	
1200 1300	mtwhf USA, WHRI Cypress Creek SC		7520na
1200 1300	USA, WHRI Cypress Creek SC		9660am
1200 1300	USA, WINB Red Lion PA	9265am	
1200 1300	USA, WRMI Miami FL	9955am	
1200 1300	USA, WTJC Newport NC	9370na	
1200 1300	USA, WWCR Nashville TN	5070na	5890na
	5935na	15825na	
1200 1300	USA, WWRB Manchester TN	3185va	
1200 1300	USA, WYFR/Family Radio FL		6890na
	7780na	11530am	11970na
1200 1300	Zambia, CVC International	6065af	
1205 1220 m	Austria, Radio Austria Intl	6155va	13730va
	17715va		
1205 1230 Sat/Sun	Austria, Radio Austria Intl	6155va	13730va
	17715va		
1205 1235 mta	UK, Sudan Radio Service	17660af	
1215 1230 twhf	Austria, Radio Austria Intl	17715va	
1215 1300	Egypt, Radio Cairo	17835as	
1230 1245 Sun	Australia, HCJB Global	15540as	
1230 1258	Vietnam, Voice of	9840as	12020as
1230 1300	Bangladesh, Bangla Betar	7185as	
1230 1300	Bulgaria, Radio	11700eu	
1230 1300	Thailand, Radio	9810va	
1235 1300 Sat/Sun	Austria, Radio Austria Intl	6155va	13730va
	17715va		
1245 1300 twhf	Austria, Radio Austria Intl	6155va	13730va
	17715va		
1245 1300 m	Austria, Radio Austria Intl	17715va	
1245 1300 Sat/Sun	UK, Bible Voice BC	5950as	

1300 UTC - 8AM EST / 7AM CST / 5AM PST

1300 1330	Egypt, Radio Cairo	17835as	
1300 1330 Sun	Slovakia, Universal Life	15750as	
1300 1356	Romania, Radio Romania Intl		15105eu
	17745eu		
1300 1357	China, China Radio Intl	13610eu	13790eu
1300 1400	Anguilla, University Network		11775am
1300 1400	Australia, CVC International	13635as	
1300 1400	Australia, Radio Australia	6020va	9560as
	9580va	9590va	
1300 1400	Australia, Radio Australia	5995va	
1300 1400	Canada, CBC NQ SW Service		9625na
1300 1400	Canada, CFRX Toronto ON	6070na	
1300 1400	Canada, CFVP Calgary AB	6030na	
1300 1400	Canada, CKZN St John's NF	6160na	
1300 1400	Canada, CKZU Vancouver BC		6160na
1300 1400	China, China Radio Intl	5995as	9570na
	9650na	9730as	9760pa
	9870as	11660as	11760pa
	13755as	15260na	11980as
1300 1400	Costa Rica, University Network		9725va
	11870va	13750va	
1300 1400	Malaysia, RTM/Trax FM	7295as	
1300 1400	New Zealand, Radio NZ Intl	5950pa	
1300 1400	Nigeria, Radio/Kaduna	4770do	6090al
1300 1400	Nigeria, Voice of/ Ext. Svc Lagos		9690af
1300 1400	North Korea, Voice of Korea		7570eu
	9335na	11710na	12015eu
1300 1400	Papua New Guinea, NBC	4890do	
1300 1400	Papua New Guinea, Wantok R. Light		7325va
1300 1400	Poland, Polish Radio	5975eu	9450eu
1300 1400	Singapore, Radio Singapore Intl		6080as
	6150as		
1300 1400	South Korea, KBS World Radio		9570na
	9770as		
1300 1400	UK, BBC World Service	5975as	6190af
	6195as	9740as	11895as
	15420af	15575va	11940af
	21470af		17830af
1300 1400	USA, American Forces Radio		4319usb
	5446usb	5765usb	6350usb
	10320usb	12133usb	13362usb

1300 1400	USA, KAIJ Dallas TX	9480va	
1300 1400	USA, KJES Vado NM	11715na	
1300 1400	USA, KTBN Salt Lake City UT		7505na
1300 1400	USA, KWHR Naalehu HI	12130as	
1300 1400	USA, Voice of America	9760va	11705va
1300 1400 w f	USA, WBCQ Monticello ME	9330am	
1300 1400	USA, WBOH Newport NC	5920am	
1300 1400	USA, WHRA Greenbush ME	15665va	
1300 1400	USA, WHRI Cypress Creek SC		9840na
1300 1400 Sat/Sun	USA, WHRI Cypress Creek SC		11785na
1300 1400	USA, WINB Red Lion PA	13570am	
1300 1400	USA, WRMI Miami FL	9955am	
1300 1400	USA, WTJC Newport NC	9370na	
1300 1400	USA, WWCR Nashville TN	5890na	9985na
	13845na	15825na	
1300 1400	USA, WWRB Manchester TN	3185va	9385va
1300 1400	USA, WYFR/Family Radio FL		7175as
	7560as	7780na	11520as
	11830na	11855na	11970na
1300 1400	Zambia, CVC International	6065af	
1310 1340	Japan, NHK World/Radio Japan		9875as
1315 1330 mwa	Australia, HCJB Global	15540as	
1330 1357 DRM/Fri-Sat	Czech Rep, Radio Prague	9750eu	
1330 1400 mtwhfa	Guam, AWR/KSDA	15660as	
1330 1400	India, All India Radio	9690as	11620as
	13710as		
1330 1400	Laos, National Radio	7145as	
1330 1400	Sweden, Radio	7420as	15240na
1330 1400	Turkey, Voice of	11735va	12035eu

1400 UTC - 9AM EST / 8AM CST / 6AM PST

1400 1415 Sat	Germany, Pan American BC	13645me	
1400 1415	Russia, FEBA	7150eu	
1400 1425	Turkey, Voice of	11735va	12035eu
1400 1429	Czech Rep, Radio Prague	11600as	13580na
1400 1430	Australia, Radio Australia	5995va	6080va
	9590va	9625va	
1400 1430 w	Germany, Pan American BC	15205as	
1400 1430 mhf	Guam, TWR/KTWR	9975as	
1400 1430	Japan, NHK World/Radio Japan		7200as
	9875as	11705na	11780af
			17580af
1400 1430	Serbia, International Radio Serbia		7240eu
1400 1430	Thailand, Radio	9725va	
1400 1430 tha	UK, Sudan Radio Service	15675af	
1400 1457	China, China Radio Intl	9700eu	9795eu
1400 1457	Netherlands, Radio	9345as	12080as
	15595as		
1400 1500	Anguilla, University Network		11775am
1400 1500	Australia, CVC International	13635as	
1400 1500	Bhutan, BBS	6035as	
1400 1500 Sat/Sun	Canada, CBC NQ SW Service		9625na
1400 1500	Canada, CFRX Toronto ON	6070na	
1400 1500	Canada, CFVP Calgary AB	6030na	
1400 1500	Canada, CKZN St John's NF	6160na	
1400 1500	Canada, CKZU Vancouver BC		6160na
1400 1500	China, China Radio Intl	5995as	9560as
	9765as	9870as	11675as
	11775as	13685af	13740na
1400 1500	Costa Rica, University Network		9725va
	11870va	13750va	
1400 1500	Germany, Overcomer Ministries		6110va
	13810va	15325va	
1400 1500 tw	Guam, TWR/KTWR	9975as	
1400 1500	India, All India Radio	9690as	11620as
	13710as		
1400 1500	Libya, Voice of Africa	17725af	21695af
1400 1500	Malaysia, RTM/Trax FM	7295as	
1400 1500	New Zealand, Radio NZ Intl	5950pa	
1400 1500	Nigeria, Radio/Kaduna	4770do	6090al
1400 1500	Nigeria, Voice of/ Ext. Svc Lagos		9690af
1400 1500 vl	Papua New Guinea, Wantok R. Light		7325va
1400 1500	Singapore, MediaCorp Radio		6150do
1400 1500 vl	South Africa, Channel Africa	9625af	
1400 1500	UK, BBC World Service	5975as	6190af
	6195as	9740as	11760va
	11920as	11940af	11895as
	21660af		21470af
1400 1500 Sat	UK, BBC World Service	9410va	
1400 1500 Sat/Sun	UK, Bible Voice BC	11695as	
1400 1500	USA, American Forces Radio		4319usb
	5446usb	5765usb	6350usb
	10320usb	12133usb	13362usb
1400 1500	USA, KAIJ Dallas TX	9480va	
1400 1500	USA, KJES Vado NM	11715na	
1400 1500	USA, KNLS Anchor Point AK	6150as	

1400 1500	USA, KLTN Salt Lake City UT	7505na	
	15590na		
1400 1500	USA, KWHR Naalehu HI	9930as	
1400 1500	USA, Voice of America	4930af	6080af
	9760va	9865va	11885va
	15205va	15580af	17715af
1400 1500	USA, WBCQ Monticello ME	9330am	
1400 1500	USA, WBOH Newport NC	5920am	
1400 1500	USA, WHRA Greenbush ME	15665va	
1400 1500 mtwhf	USA, WHRI Cypress Creek SC	9495na	
1400 1500	USA, WHRI Cypress Creek SC	9840na	
1400 1500 Sat/Sun	USA, WHRI Cypress Creek SC	11785na	
1400 1500	USA, WINB Red Lion PA	13570am	
1400 1500	USA, WRMI Miami FL	9955am	
1400 1500	USA, WTJC Newport NC	9370na	
1400 1500	USA, WWCN Nashville TN	5890na	9985na
	13845na	15825na	
1400 1500	USA, WWRB Manchester TN	9385va	
1400 1500	USA, WYFR/Family Radio FL	5920as	
	7560as	11560as	11565na
	13695na	17760na	
1400 1500	Zambia, CVC International	6065af	
1415 1430 mtwhfa	Germany, Pan American BC	13645as	
1415 1430	Nepal, Radio	3230as	5005as
	7165as		6100as
1415 1445 Mon	UAE, FEBA	12025eu	
1425 1500	Micronesia, PMA/The Cross	4755as	
1430 1445 Sun	Germany, Pan American BC	13645as	13750as
1430 1445 Fri	UAE, FEBA	12025eu	
1430 1500	Australia, Radio Australia	5995va	6080va
	9475as	9590va	9625va
			11660pa
1430 1500	Ethiopia, Radio	5990af	7110af
1430 1500 DRM	South Korea, KBS World Radio		9750eu
1430 1500	Sweden, Radio	11550va	
1430 1500	USA, Voice of America	6105va	7225va
	9715va	15130va	

1500 UTC - 10AM EST / 9AM CST / 7AM PST

1500 1510 mtwhfa	Turkmenistan, Turkmen Radio	5015eu	
1500 1527	Czech Rep, Radio Prague	7385na	
1500 1528	Vietnam, Voice of	9550va	9840va
	12020va	13860va	
1500 1530	Guam, AWR/KSDA	12105as	
1500 1530	Nigeria, Radio, Natl Svc/Abuja		7275do
1500 1530	UK, BBC World Service	11860af	15420af
	17640af		
1500 1530 ta	UK, Bible Voice BC	11895as	
1500 1530	USA, Voice of America	6105va	9760va
	15460va		
1500 1545	Sweden, IBRA Radio	7340as	
1500 1557	Canada, Radio Canada Intl	9635va	11975va
1500 1557	China, China Radio Intl	9435eu	9525eu
1500 1557	Netherlands, Radio	9345af	12080as
	15595as		
1500 1600	Anguilla, University Network		11775am
1500 1600	Australia, CVC International	13635as	
1500 1600	Australia, Radio Australia	5995va	6080va
	9475as	9590va	9625va
1500 1600 Sat/Sun	Canada, CBC NQ SW Service		9625na
1500 1600	Canada, CFRX Toronto ON	6070na	
1500 1600	Canada, CFVP Calgary AB	6030na	
1500 1600	Canada, CKZN St John's NF	6160na	
1500 1600	Canada, CKZU Vancouver BC		6160na
1500 1600	China, China Radio Intl	5955as	6100af
	7160as	7325as	9785as
	11775as	13685af	13740na
1500 1600	Costa Rica, University Network		9725va
	11870va	13750va	
1500 1600	Germany, CVC Intl/Voice Africa	15680af	
1500 1600	Germany, Overcomer Ministries		6110va
	13810va	15325va	
1500 1600	Libya, Voice of Africa	17725af	21695af
1500 1600	Malaysia, RTM/Trax FM	7295as	
1500 1600	Myanmar, Myanma Radio	5985as	
1500 1600	New Zealand, Radio NZ Intl	5950pa	
1500 1600	Nigeria, Radio/Kaduna	4770do	6090al
1500 1600	Nigeria, Voice of/ Ext. Svc Lagos		9690af
1500 1600	North Korea, Voice of Korea		7570eu
	9335na	11710na	12015eu
1500 1600 vl	Papua New Guinea, Wantok R. Light		7325va
1500 1600	Russia, Voice of	7350as	7260as
1500 1600 DRM	Russia, Voice of	5905eu	
1500 1600	Singapore, MediaCorp Radio		6150do
1500 1600 vl	Slovakia, Miraya FM		9825af
1500 1600	South Africa, Channel Africa	17770af	

1500 1600	UK, BBC World Service	6040as	6190af
	6195as	9740as	11920as
	12095va	15105af	17640af
	21470af	21660af	
1500 1600 Sat	UK, BBC World Service	9410va	
1500 1600	USA, American Forces Radio		4319usb
	5446usb	5765usb	6350usb
	10320usb	12133usb	13362usb
1500 1600	USA, KAIJ Dallas TX	9480va	
1500 1600	USA, KLTN Salt Lake City UT		7505na
	15590na		
1500 1600	USA, KWHR Naalehu HI	9930as	
1500 1600	USA, Voice of America	4930af	6080af
	7125af	9520va	9865va
	11765va	12150va	13735va
	17715af	17895af	
1500 1600	USA, WBCQ Monticello ME	9330am	
1500 1600	USA, WBOH Newport NC	5920am	
1500 1600	USA, WEWN Vandiver AL	11530na	
1500 1600 mtwhfa	USA, WHRA Greenbush ME	15665va	
1500 1600	USA, WHRI Cypress Creek SC		9840na
1500 1600	USA, WHRI Cypress Creek SC		11785na
1500 1600	USA, WINB Red Lion PA	13570am	
1500 1600	USA, WRMI Miami FL	9785na	
1500 1600	USA, WTJC Newport NC	9370na	
1500 1600	USA, WWCN Nashville TN	9985na	12160na
	13845na	15825na	
1500 1600	USA, WWRB Manchester TN	9385va	
1500 1600	USA, WYFR/Family Radio FL	5920as	
	6280as	11565na	11855va
	15210am	17760na	17690af
1500 1600	Zambia, CVC International	4965af	
1505 1520 m	Austria, Radio Austria Intl	13775ca	
1505 1530 Sat/Sun	Austria, Radio Austria Intl	13775ca	
1510 1545	Swaziland, TWR 4760af		
1515 1530 twhf	Austria, Radio Austria Intl	13775ca	
1515 1600 Sat	UK, Bible Voice BC	12035as	
1530 1545	India, All India Radio	7255af	9820af
	9910af		
1530 1600 mtwhfa	Albania, Radio Tirana	13640na	
1530 1600	Germany, AWR Europe	11675as	
1530 1600	Iran, Voice of the Islamic Rep		6160as
	7330as		
1530 1600	Sweden, Radio	7440va	15240na
1530 1600 mh	UK, Bible Voice BC	12035as	
1530 1600	USA, Voice of America	6105va	7175va
	9760va	15460va	
1535 1600 Sat/Sun	Austria, Radio Austria Intl	13775ca	
1545 1600 m	Austria, Radio Austria Intl	13775ca	
1545 1600 twhf	Austria, Radio Austria Intl	13775ca	
1551 1600 DRM	New Zealand, Radio NZ Intl	7145pa	

1600 UTC - 11AM EST / 10AM CST / 8AM PST

1600 1615	Pakistan, Radio	6230eu	7520eu
1600 1628	Vietnam, Voice of		7280va
	9730va	11630va	13860va
1600 1630	Guam, AWR/KSDA		9585as
1600 1630	Iran, Voice of the Islamic Rep		6160as
	7330as		
1600 1630	Myanmar, Myanma Radio	9730do	
1600 1630	Nigeria, Voice of/ Ext. Svc Lagos		9690af
1600 1630 Sat/Sun	Swaziland, TWR 4760af		
1600 1657	China, China Radio Intl	7255eu	9435eu
	9525eu		
1600 1700	Anguilla, University Network		11775am
1600 1700	Australia, CVC International	13635as	
1600 1700	Australia, Radio Australia	5995va	6080va
	9475as	9710va	11660pa
1600 1700 Sat	Canada, CBC NQ SW Service		9625na
1600 1700	Canada, CFRX Toronto ON	6070na	
1600 1700	Canada, CFVP Calgary AB	6030na	
1600 1700	Canada, CKZN St John's NF	6160na	
1600 1700	Canada, CKZU Vancouver BC		6160na
1600 1700	China, China Radio Intl	6100af	9570af
	11800af		
1600 1700	Costa Rica, University Network		11870va
	13750va		
1600 1700	Egypt, Radio Cairo	11740af	
1600 1700	Ethiopia, Radio	7165af	9560af
1600 1700	France, Radio France Intl	11615af	15160af
1600 1700	Germany, CVC Intl/Voice Africa		15680af
1600 1700	Germany, Deutsche Welle	5965as	9795as
1600 1700 Sun	Germany, Overcomer Ministries		6110eu
1600 1700	Jordan, Radio	11690na	
1600 1700	Malaysia, RTM/Trax FM	7295as	

1600 1700	New Zealand, Radio NZ Intl	5950pa	
1600 1700 DRM	New Zealand, Radio NZ Intl	7145pa	
1600 1700	Nigeria, Radio/Kaduna	4770do	6090al
1600 1700	North Korea, Voice of Korea		9990va
	11545va		
1600 1700 vl	Papua New Guinea, Wantok R. Light	7325va	
1600 1700	Russia, Voice of	4965va 4975va	6130eu
	7260as 7305as	7320eu	9470me
1600 1700 vl	Rwanda, Radio	6055do	
1600 1700 vl	Slovakia, Miraya FM	9825af	
1600 1700	South Korea, KBS World Radio		9515eu
1600 1700	Taiwan, Radio Taiwan Intl	9785as	11550as
1600 1700	UK, BBC World Service	3255af	3915as
	6190af 6195as	11665va	11920as
	11940af 12095va	15105va	15400af
	17830af 21470af	21660af	
1600 1700 Sat	UK, BBC World Service	9410va	
1600 1700	USA, American Forces Radio		4319usb
	5446usb 5765usb	6350usb	7811usb
	10320usb 12133usb	13362usb	
1600 1700	USA, KAIJ Dallas TX	9480va	
1600 1700	USA, KJES Vado NM	11715na	
1600 1700	USA, KTNB Salt Lake City UT		15590na
1600 1700	USA, KWHR Naalehu HI	9930as	
1600 1700	USA, Voice of America	4930af	6080af
	15580af 13600va	13615va	15445va
	17715af 17895af		
1600 1700	USA, WBCQ Monticello ME	9330am	
1600 1700	USA, WBOH Newport NC	5920am	
1600 1700	USA, WEWN Vandiver AL	11530na	
1600 1700	USA, WHRA Greenbush ME	17650af	
1600 1700	USA, WHRI Cypress Creek SC		9840na
	15285am		
1600 1700	USA, WINB Red Lion PA	13570am	
1600 1700 smtwhf	USA, WMLK Bethel PA	9265va	
1600 1700	USA, WRMI Miami FL	7385na	
1600 1700	USA, WTJC Newport NC	9370na	
1600 1700	USA, WWCN Nashville TN	9985na	12160na
	13845na 15825na		
1600 1700 Sun	USA, WWRB Manchester TN	11920af	
1600 1700	USA, WWRB Manchester TN	9385va	12180va
1600 1700	USA, WYFR/Family Radio FL		6085am
	9885af 11565na	11830na	11845af
	12010as 13695na	15325af	17690af
	17760na 18980va	21455va	
1600 1700	Zambia, CVC International	4965af	
1605 1700	Canada, Radio Canada Intl	9610na	
1615 1645 mtwhf	Swaziland, TWR 6130af		
1615 1700 Sat/Sun	UK, BBC World Service	11860af	15420af
	17640af		
1630 1645 Sun	Germany, Pan American BC	9850me	
1630 1700	Guam, AWR/KSDA	11980as	
1630 1700	Nigeria, Voice of/ Ext. Svc Lagos		15120af
1630 1700 Sat/Sun	Swaziland, TWR 6130af		
1630 1700 Sun	UK, Bible Voice BC	9460me	
1640 1650 mtwhfa	Turkmenistan, Turkmen Radio		4930eu
1640 1700 mtwhf	UK, Bible Voice BC	9460me	
1645 1700 f	Sweden, IBRA Radio	9830as	
1645 1700	Tajikistan, Tajik Radio	7245as	
1645 1700 Sat	UK, Bible Voice BC	9460me	

1700 UTC - 12PM EST / 11AM CST / 9AM PST

1700 1715	Swaziland, TWR 6130af		
1700 1715 twhfa	UK, Bible Voice BC	9460me	
1700 1720 mtwh	Moldova, Radio DMR Pridnestrovy	6235eu	
1700 1727	Czech Rep, Radio Prague	5930eu	15710af
1700 1730	Jordan, Radio	11690na	
1700 1740 f	Moldova, Radio DMR Pridnestrovy	6235eu	
1700 1745	UK, BBC World Service	6005af	9630af
1700 1750	New Zealand, Radio NZ Intl	5950pa	
1700 1750 DRM	New Zealand, Radio NZ Intl	9890pa	
1700 1757	China, China Radio Intl	6100eu	7205eu
	7255eu 7335eu		
1700 1800	Anguilla, University Network		11775am
1700 1800	Australia, CVC International	13635as	
1700 1800	Australia, Radio Australia	5995va	6080va
	9475as 9580va	9710as	11880va
1700 1800 Sat	Canada, CBC NQ SW Service		9625na
1700 1800	Canada, CFRX Toronto ON	6070na	
1700 1800	Canada, CFVP Calgary AB	6030na	
1700 1800	Canada, CKZN St John's NF	6160na	
1700 1800	Canada, CKZU Vancouver BC		6160na
1700 1800 DRM	Canada, Radio Canada Intl	9800na	
1700 1800	China, China Radio Intl	9570af	11900af
1700 1800	Costa Rica, University Network		11870va

1700 1800	Egypt, Radio Cairo	11740af	
1700 1800	Eqt. Guinea, Radio Africa	15190af	
1700 1800	Germany, CVC Intl/Voice Africa		15680af
1700 1800	Malaysia, RTM/Trax FM	7295as	
1700 1800	Nigeria, Radio/Kaduna	4770do	6090al
1700 1800	Nigeria, Voice of/ Ext. Svc Lagos		15120af
1700 1800 vl	Papua New Guinea, Wantok R. Light		7325va
1700 1800	Russia, Voice of	6125as	7125as
	7270va 7320eu	9470me	
1700 1800 vl	Rwanda, Radio	6055do	
1700 1800 vl	Slovakia, Miraya FM	9825af	
1700 1800	South Africa, Channel Africa	15235af	
1700 1800	Swaziland, TWR 3200af		
1700 1800	Taiwan, Radio Taiwan Intl	11850af	
1700 1800	UK, BBC World Service	3255af	3915as
	6190af 11665va	11755af	11955as
	12095af 15400af	17830af	21470af
1700 1800 Sun	UK, Bible Voice BC	9460me	
1700 1800	USA, American Forces Radio		4319usb
	5446usb 5765usb	6350usb	7811usb
	10320usb 12133usb	13362usb	
1700 1800	USA, KAIJ Dallas TX	9480va	
1700 1800	USA, KTNB Salt Lake City UT		15590na
1700 1800	USA, KWHR Naalehu HI	9930as	
1700 1800	USA, Voice of America	6080af	13710af
	15580af 17895af		
1700 1800	USA, WBCQ Monticello ME	9330am	17495am
1700 1800	USA, WBOH Newport NC	5920am	
1700 1800	USA, WEWN Vandiver AL	11530na	
1700 1800	USA, WHRI Cypress Creek SC		15285am
1700 1800	USA, WINB Red Lion PA	13570am	
1700 1800 smtwhf	USA, WMLK Bethel PA	9265va	
1700 1800	USA, WRMI Miami FL	9955am	
1700 1800	USA, WTJC Newport NC	9370na	
1700 1800	USA, WWCN Nashville TN	9985na	12160na
	13845na 15825na		
1700 1800 Sun	USA, WWRB Manchester TN	11920af	
1700 1800	USA, WWRB Manchester TN	9285va	12180va
1700 1800	USA, WYFR/Family Radio FL		3955va
	9885af 13695na	17555na	18980va
	21455va 21680af		
1700 1800	Zambia, CVC International	4965af	
1715 1730 h	UK, Bible Voice BC	9460me	
1715 1745 t	UK, Bible Voice BC	9460me	
1730 1745 h	UK, Bible Voice BC	9460me	
1730 1800	Guam, AWR/KSDA	9980me	
1730 1800	Slovakia, Radio Slovakia Int	5915eu	6055eu
1730 1800	Swaziland, TWR 9500af		
1730 1800 Sat	UK, Bible Voice BC	9460me	
1730 1800 Sun	UK, Bible Voice BC	9615me	
1730 1800 Sat/Sun	USA, Voice of America	4930af	12080af
	15775af		
1730 1800	USA, Voice of America	4930af	12080af
	15775af		
1745 1800	Bangladesh, Bangla Betar	7185as	
1745 1800	India, All India Radio	7410eu	9445af
	9950eu 11620eu	11935af	13605af
	15075af 15155af	17670af	
1745 1800 t	UK, Bible Voice BC	9460me	
1751 1800	New Zealand, Radio NZ Intl	9615pa	
1751 1800 DRM	New Zealand, Radio NZ Intl	9890pa	

1800 UTC - 1PM EST / 12PM CST / 10AM PST

1800 1805	Canada, Radio Canada Intl	9610na	
1800 1805 DRM	Canada, Radio Canada Intl	9800na	
1800 1809	Tanzania, Voice of	11735af	
1800 1815 t/vl	UK, Bible Voice BC	9460me	
1800 1815 Sat	UK, Bible Voice BC	7210as	
1800 1827	Czech Rep, Radio Prague	5930eu	9400va
1800 1828	Vietnam, Voice of	5955eu	7280va
	9730va		
1800 1830	Nigeria, Radio, Natl Svc/Abuja	7275do	
1800 1830	South Africa, AWR Africa	3215af	3345af
	11830af		
1800 1830	UK, BBC World Service	11955as	
1800 1830 Sat/Sun	UK, Bible Voice BC	9460me	
1800 1830	USA, Voice of America	4930af	6080af
	11975af 13710af	15580af	17895af
1800 1856	Romania, Radio Romania Intl		7215eu
	9640eu		
1800 1857	China, China Radio Intl	6100eu	7110eu
1800 1857	Netherlands, Radio	6020af	11655af

1800 1900	12050af		
1800 1900	mtwhf	Anguilla, University Network	11775am
1800 1900		Argentina, RAE 9690eu	15345eu
		Australia, Radio Australia	6080va 9475as
		9580va 9710va	11880va
1800 1900		Bangladesh, Bangla Betar	7185eu
1800 1900		Canada, CFRX Toronto ON	6070na
1800 1900		Canada, CFVP Calgary AB	6030na
1800 1900		Canada, CKZN St John's NF	6160na
1800 1900		Canada, CKZU Vancouver BC	6160na
1800 1900		Canada, Radio Canada Intl	17790af
1800 1900		Costa Rica, University Network	11870va
		13750va	
1800 1900		Eqt. Guinea, Radio Africa	15190af
1800 1900		Germany, CVC Intl/Voice Africa	9490af
1800 1900		India, All India Radio	7410eu 9445af
		9950eu 11620eu	11935af 13605af
		15075af 15155af	17670af
1800 1900		Kuwait, Radio Kuwait	11990na
1800 1900		Malaysia, RTM/Trax FM	7295as
1800 1900		New Zealand, Radio NZ Intl	9615pa
1800 1900	DRM	New Zealand, Radio NZ Intl	9890pa
1800 1900		Nigeria, Radio/Kaduna	4770do 6090al
1800 1900		Nigeria, Voice of/ Ext. Svc Lagos	15120af
1800 1900		North Korea, Voice of Korea	7570eu
		12015eu	
1800 1900	vl	Papua New Guinea, Wantok R. Light	7325va
1800 1900		Poland, Polish Radio	6015eu 7130eu
1800 1900		Russia, Voice of	6125as 7105eu 7125as
		7235as 7270af	7320eu 7335va
		11510af	
1800 1900	Sat/Sun	Russia, Voice of	6055eu 6175eu
1800 1900	vl	Rwanda, Radio	6055do
1800 1900	fas	Slovakia, European Gospel Radio	7285va
1800 1900		South Korea, KBS World Radio	7275eu
1800 1900		Swaziland, TWR	9500af
1800 1900		Taiwan, Radio Taiwan Intl	3965eu
1800 1900		UK, BBC World Service	3255af 5875va
		5955as 6005af	6190af 6195va
		9410af 9480va	11755af 12095af
		15400af 17830af	
1800 1900	Sat	UK, Bible Voice BC	9615me
1800 1900		USA, American Forces Radio	4319usb
		5446usb 5765usb	6350usb 7811usb
		10320usb 12133usb	13362usb
1800 1900		USA, KAIJ Dallas TX	9480va
1800 1900		USA, KJES Vado NM	15385na
1800 1900	smtwhf	USA, KTNB Salt Lake City UT	15590na
1800 1900		USA, WBCQ Monticello ME	7415am
1800 1900		USA, WBCQ Monticello ME	9330am 17495am
1800 1900		USA, WBOH Newport NC	5920am
1800 1900		USA, WEWN Vandiver AL	11530na
1800 1900	mtwhf	USA, WHRI Cypress Creek SC	15670va
1800 1900	Sat/Sun	USA, WHRI Cypress Creek SC	15285va
1800 1900		USA, WINB Red Lion PA	13570am
1800 1900	smtwhf	USA, WMLK Bethel PA	9265va
1800 1900		USA, WRMI Miami FL	9955am
1800 1900		USA, WTJC Newport NC	9370na
1800 1900		USA, WWCR Nashville TN	9985na 12160na
		13845na 15825na	
1800 1900	Sun	USA, WWRB Manchester TN	11920af
1800 1900		USA, WWRB Manchester TN	9385va 12180va
1800 1900		USA, WYFR/Family Radio FL	7240va
		7345va 7395af	9885af 9895af
		11665af 13660af	13695na 15115af
		17555na 18980va	
1800 1900		Yemen, Rep of Yemen Radio	9780me
1800 1900		Zambia, CVC International	4965af
1830 1845		Israel, Kol Israel	6985va 7545va 9345va
		15640af	
1830 1900		Bulgaria, Radio	7400eu 9400eu
1830 1900	whf	Sweden, Radio	6065va
1830 1900		UK, BBC World Service	6005af 9630af
1830 1900	f	UK, Bible Voice BC	9460me
1830 1900	Sun	UK, Bible Voice BC	9615me
1830 1900		USA, Voice of America	4930af 6080af
		6105va 7220va	9650af 11975af
		13710af 15580af	17895af
1830 1900		Vatican City, Vatican Radio	9755af 11625af
		13725af	
1845 1900	Sun	UK, Bible Voice BC	7260af

1900 UTC - 2PM EST / 1PM CST / 11AM PST

1900 1903	Bahrain, Radio Bahrain	6010as
1900 1928	Vietnam, Voice of	7280va 9720va

1900	1930		Germany, Deutsche Welle	9735af	11690af
			13780af 15275af		
1900	1930	Sat	UK, Bible Voice BC	9460me	
1900	1930	Sun	UK, Bible Voice BC	6010eu	7245af
1900	1930		USA, Voice of America	9785va	12020va
1900	1935	DRM	New Zealand, Radio NZ Intl	9890pa	
1900	1945		India, All India Radio	7410eu	9445af
			9950eu 11620eu	11935af	13605af
			15075af 15155af	17670af	
1900	1945	Sat	UK, Bible Voice BC	6010eu	
1900	1950		New Zealand, Radio NZ Intl	9615pa	
1900	1957		Netherlands, Radio	7120af	11655af
			11805af 12050af	17810af	
1900	1957	Sat/Sun	Netherlands, Radio	15315na	15525na
1900	2000		Anguilla, University Network		11775am
1900	2000		Australia, Radio Australia	6080va	9500as
			9580va 9710va	11880as	
1900	2000		Canada, CFRX Toronto ON	6070na	
1900	2000		Canada, CFVP Calgary AB	6030na	
1900	2000		Canada, CKZN St John's NF	6160na	
1900	2000		Canada, CKZU Vancouver BC		6160na
1900	2000		Canada, Radio Canada Intl	17790af	
1900	2000		China, China Radio Intl	7295va	9435va
			9440va		
1900	2000		Costa Rica, University Network		11870va
			13750va		
1900	2000		Egypt, Radio Cairo	15375af	
1900	2000		Eqt Guinea, Radio Africa	15190af	
1900	2000		Germany, CVC Intl/Voice Africa		9490af
1900	2000		Malaysia, RTM/Trax FM	7295as	
1900	2000		Nigeria, Radio/Kaduna	4770do	6090al
1900	2000		Nigeria, Voice of/ Ext. Svc Lagos		15120af
1900	2000		North Korea, Voice of Korea		7100af
			9975va 11910af	11535va	
1900	2000		Papua New Guinea, NBC	4890do	
1900	2000	vl	Papua New Guinea, Wantok R. Light		7325va
1900	2000		Russia, Voice of	5955as 6175eu	7105eu
			7290eu 7335af	11510af	
1900	2000	vl	Rwanda, Radio	6055do	
1900	2000	fas	Slovakia, European Gospel Radio		7285va
1900	2000	vl	Solomon Islands, SIBC	5020do	9545al
1900	2000	vl	South Africa, Channell Africa	3345af	
1900	2000	Mon	South Africa, DX Amateur League		3215af
1900	2000		Thailand, Radio	9805eu	
1900	2000	vl	Uganda, Radio	4976do	
1900	2000		UK, BBC World Service	3255af	5875va
			6005af 6190af	6195va	9410af
			9480va 9630af	12095af	15400af
			17830af		
1900	2000	Sat/Sun	UK, Bible Voice BC	9470me	
1900	2000	Sun	UK, Bible Voice BC	7260af	
1900	2000		USA, American Forces Radio		4319usb
			5446usb 5765usb	6350usb	7811usb
			10320usb 12133usb	13362usb	
1900	2000		USA, KAIJ Dallas TX	9480va	
1900	2000		USA, KJES Vado NM	15385na	
1900	2000		USA, KTNB Salt Lake City UT		15590na
1900	2000		USA, Voice of America	4930af	6080af
			11975af 13710af	15580af	17895af
1900	2000		USA, WBCQ Monticello ME	7415am	9330am
			17495am		
1900	2000		USA, WBOH Newport NC	5920am	
1900	2000		USA, WEWN Vandiver AL	11530na	
1900	2000		USA, WHRA Greenbush ME	11785va	
1900	2000		USA, WHRI Cypress Creek SC		9840na
			17640am		
1900	2000		USA, WINB Red Lion PA	13570am	
1900	2000	smtwhf	USA, WMLK Bethel PA	9265va	
1900	2000		USA, WRMI Miami FL	9955am	
1900	2000		USA, WTJC Newport NC	9370na	
1900	2000		USA, WWCR Nashville TN	9975na	12160na
			13845na 15825na		
1900	2000	Sun	USA, WWRB Manchester TN	11920va	
1900	2000		USA, WWRB Manchester TN	9385va	12180va
1900	2000		USA, WYFR/Family Radio FL		3230af
			6020af 6085am	7160af	7395af
			13695na 15115af	15565va	17555na
			17535na 18980va		
1900	2000		Zambia, CVC International	4965af	
19000	2000		Kuwait, Radio Kuwait	11990na	
1930	2000	Sat/Sun	Germany, Pan American BC	6020va	
1930	2000		Iran, Voice of the Islamic Rep		6010eu
			6225eu 7320eu	9855af	11695af
1930	2000		Serbia, International Radio Serbia		7240eu
1930	2000		Slovakia, Radio Slovakia Int	5915eu	7345eu
1930	2000		Turkey, Voice of	6055eu	
1930	2000	f	UK, Bible Voice BC	9470me	

1930	2000	USA, Voice of America	6105va	7220va
		9650va	9785va	12020va
1936	1950	DRM New Zealand, Radio NZ Intl	11675pa	
1945	2000	mtwhfa Albania, Radio Tirana	6135eu	7465eu
1951	2000	New Zealand, Radio NZ Intl	17675pa	
1951	2000	DRM New Zealand, Radio NZ Intl	15720pa	

2000 UTC - 3PM EST / 2PM CST / 12PM PST

2000	2015	Sun	Germany, Pan American BC	6020va	
2000	2025		Turkey, Voice of	6055eu	
2000	2030		China, China Radio Intl	7160eu	
2000	2030		Egypt, Radio Cairo	15375af	
2000	2030	fa	Germany, Pan American BC	6020me	
2000	2030		Iran, Voice of the Islamic Rep	6010eu	
			6225eu	7320eu	9855af
					11695af
2000	2030		South Africa, AWR Africa	9655af	
2000	2030	Sun	UK, Bible Voice BC	6010eu	
2000	2030		USA, Voice of America	4930af	4940af
			6080af	11975af	13710af
2000	2045		USA, WYFR/Family Radio FL	5745va	
			6020af	6240va	6875va
					15115af
				15195af	17535na
					17575 an
2000	2057		China, China Radio Intl	7190eu	9600eu
2000	2057		Netherlands, Radio	11655af	18910af
2000	2100		Anguilla, University Network	11775am	
2000	2100		Australia, ABC NT Alice Springs	2310do	
			4835do		
2000	2100		Australia, ABC NT Katherine	2485do	
2000	2100		Australia, ABC NT Tennant Creek	2325do	
2000	2100		Australia, Radio Australia	9500as	11650pa
			11660pa	11880as	12080va
2000	2100	Sat/Sun	Australia, Radio Australia	6080va	
2000	2100		Canada, CFRX Toronto ON	6070na	
2000	2100		Canada, CFVP Calgary AB	6030na	
2000	2100		Canada, CKZN St John's NF	6160na	
2000	2100		Canada, CKZU Vancouver BC	6160na	
2000	2100		China, China Radio Intl	5960eu	7285eu
			7295af	9440af	11640af
2000	2100		Costa Rica, University Network	13750va	
2000	2100		Eqt Guinea, Radio Africa	15190af	
2000	2100		Germany, CVC Intl/Voice Africa	7285af	
2000	2100		Germany, Deutsche Welle	9690af	9880af
			12780af		
2000	2100		Indonesia, Voice of	9525al	11785pa
			15150as		
2000	2100		Kuwait, Radio Kuwait	11990na	
2000	2100	vl	Liberia, ELWA	4760do	
2000	2100		Malaysia, RTM/Trax FM	7295as	
2000	2100		New Zealand, Radio NZ Intl	17675pa	
2000	2100	DRM	New Zealand, Radio NZ Intl	15720pa	
2000	2100		Nigeria, Radio/Kaduna	4770do	6090al
2000	2100		Nigeria, Voice of/ Ext. Svc Lagos	15120af	
2000	2100		Papua New Guinea, NBC	4890do	
2000	2100	vl	Papua New Guinea, Wantok R. Light	7325va	
2000	2100		Russia, Voice of	6145eu	7105eu
2000	2100	vl	Rwanda, Radio	6055do	
2000	2100	vl	Solomon Islands, SIBC	5020do	9545al
2000	2100	vl	South Africa, Channel Africa	3345af	
2000	2100	mtwhf	Spain, Radio Exterior Espana	9605af	
			9690eu		
2000	2100	vl	Uganda, Radio	4976do	5026do
2000	2100		UK, BBC World Service	3255af	6005af
			6190af	6195va	9410af
				12095af	15400af
					17830af
2000	2100		Ukraine, Radio Ukraine Intl	5840eu	
2000	2100		USA, American Forces Radio	4319usb	
			5446usb	5765usb	6350usb
				10320usb	12133usb
					13362usb
2000	2100		USA, KAIJ Dallas TX	9480va	
2000	2100		USA, KJES Vado NM	15385na	
2000	2100		USA, KTBN Salt Lake City UT	15590na	
2000	2100		USA, WBCQ Monticello ME	7415am	9330am
			17495am		
2000	2100		USA, WBOH Newport NC	5920am	
2000	2100		USA, WEWN Vandiver AL	11530na	
2000	2100	mtwhf	USA, WHRA Greenbush ME	7520va	
2000	2100	Sat/Sun	USA, WHRA Greenbush ME	11785af	
2000	2100		USA, WHRI Cypress Creek SC	17640sa	
2000	2100	mtwhfa	USA, WHRI Cypress Creek SC	11765na	
2000	2100	f	USA, WHRI Cypress Creek SC	15665af	
2000	2100		USA, WINB Red Lion PA	13570am	
2000	2100	smtwhf	USA, WMLK Bethel PA	9265va	
2000	2100		USA, WRMI Miami FL	9955am	
2000	2100		USA, WTJC Newport NC	9370na	
2000	2100		USA, WWCN Nashville TN	9975na	13845na

2000	2100	Sun	15825na	
2000	2100		USA, WWRB Manchester TN	11920af
2000	2100		USA, WWRB Manchester TN	9385va
2000	2100		Zambia, CVC International	4965af
2005	2100		Syria, Radio Damascus	9330eu
2030	2045		Thailand, Radio	9535eu
2030	2058		Sweden, Radio	7420pa
2030	2100		USA, Voice of America	4930af
			6080af	7595af
				11975af
2030	2358		Vietnam, Voice of	9840as
2045	2100		India, All India Radio	7410eu
			9910pa	9950eu
				11620eu
2045	2100	DRM	Vatican City, Vatican Radio	9800eu

2100 UTC - 4PM EST / 3PM CST / 1PM PST

2100	2127		Czech Rep, Radio Prague	5930va	9430va
2100	2130	mtwhfa	Albania, Radio Tirana	7430eu	9915na
2100	2130		Australia, ABC NT Katherine	2485do	
2100	2130		Australia, ABC NT Tennant Creek	2325do	
2100	2130		Austria, AWR Europe	9830af	
2100	2130	Sat	Canada, CBC NQ SW Service	9625na	
2100	2130		China, China Radio Intl	11640af	13630af
2100	2130		Nigeria, Radio, Natl Svc/Abuja	7275do	
2100	2130		South Africa, AWR Africa	9830af	
2100	2130		South Korea, KBS World Radio	3955eu	
2100	2130		Vatican City, Vatican Radio	7365af	9755af
			11625af		
2100	2157		China, China Radio Intl	5960eu	6135eu
			7190eu	7285eu	9600eu
2100	2159		Canada, Radio Canada Intl	5850eu	9770eu
2100	2200		Anguilla, University Network	11775am	
2100	2200		Australia, ABC NT Alice Springs	2310do	
			4835do		
2100	2200		Australia, Radio Australia	9500as	9660as
			11650pa	11660pa	11695as
				13630as	15515as
2100	2200		Belarus, Radio	6090eu	7360eu
2100	2200		Canada, CFRX Toronto ON	6070na	
2100	2200		Canada, CFVP Calgary AB	6030na	
2100	2200		Canada, CKZN St John's NF	6160na	
2100	2200		Canada, CKZU Vancouver BC	6160na	
2100	2200		Costa Rica, University Network	13750va	
2100	2200		Eqt Guinea, Radio Africa	15190af	
2100	2200		Germany, Deutsche Welle	7280af	9545af
			11690af	13780af	
2100	2200		Guyana, Voice of	3291do	5950do
2100	2200		India, All India Radio	7410eu	9445eu
			9910pa	9950eu	11620eu
2100	2200	vl	Liberia, ELWA	4760do	
2100	2200		Malaysia, RTM/Trax FM	7295as	
2100	2200		New Zealand, Radio NZ Intl	17675pa	
2100	2200	DRM	New Zealand, Radio NZ Intl	15720pa	
2100	2200		Nigeria, Radio/Kaduna	4770do	6090al
2100	2200		Nigeria, Voice of/ Ext. Svc Lagos	7255af	
2100	2200		North Korea, Voice of Korea	7570eu	
			12015eu		
2100	2200		Papua New Guinea, NBC	4890do	
2100	2200	vl	Papua New Guinea, Wantok R. Light	7325va	
2100	2200		Russia, Voice of	6145eu	7290eu
2100	2200	vl	South Africa, Channel Africa	3345af	
2100	2200		Syria, Radio Damascus	9330eu	12085eu
2100	2200		UK, BBC World Service	3255af	3915as
			5965as	6005af	6125as
				6195va	9410af
				15400af	9525am
2100	2200		USA, American Forces Radio	4319usb	
			5446usb	5765usb	6350usb
				10320usb	12133usb
					13362usb
2100	2200		USA, KAIJ Dallas TX	9480va	
2100	2200		USA, KTBN Salt Lake City UT	15590na	
2100	2200		USA, Voice of America	6080af	15580af
2100	2200		USA, WBCQ Monticello ME	7415am	9330am
			17495am		
2100	2200		USA, WBOH Newport NC	5920am	
2100	2200		USA, WEWN Vandiver AL	11530na	
2100	2200		USA, WHRA Greenbush ME	7520af	
2100	2200		USA, WHRI Cypress Creek SC	9575am	
2100	2200	mtwhfa	USA, WHRI Cypress Creek SC	11765na	
2100	2200		USA, WINB Red Lion PA	13570am	
2100	2200		USA, WRMI Miami FL	9955am	
2100	2200		USA, WTJC Newport NC	9370na	
2100	2200		USA, WWCN Nashville TN	9975na	12160na
			13845na	15825na	
2100	2200	Sun	USA, WWRB Manchester TN	11920af	
2100	2200		USA, WWRB Manchester TN	9385va	12180va

2100	2200	USA, WYFR/Family Radio FL	5745va	
		6240va 6875eu 15195af 15565af		
		17535na		
2115	2200	Egypt, Radio Cairo	6250eu	
2115	2200	USA, WYFR/Family Radio FL	11875af	
2127	2157	Sweden, Radio 7120af		
2130	2156	Romania, Radio Romania Intl	6055va	
		6155va 7145va 9755va		
2130	2200	Australia, ABC NT Katherine	5025do	
2130	2200	Australia, ABC NT Tennant Creek	4910do	
2130	2200	Canada, CBC NQ SW Service	9625na	
2130	2200	Guam, AWR/KSDA	9720as	
2130	2200	Turkey, Voice of	7180va	
2130	2200	USA, Voice of America	7405af	
2150	2200	Vatican City, Vatican Radio	5885eu 7250eu	

2200 UTC - 5PM EST / 4PM CST / 2PM PST

2200	2210	Syria, Radio Damascus	9330eu	12085eu
2200	2220	Japan, NHK World/Radio Japan		13640pa
2200	2220	Vatican City, Vatican Radio	5885eu	7250eu
2200	2230	India, All India Radio	7410eu	9445eu
		9910pa 9950eu 11620eu 11715pa		
2200	2230	Papua New Guinea, NBC	4890do	
2200	2230	Turkey, Voice of	7180va	
2200	2240	New Zealand, Radio NZ Intl	17675pa	
2200	2240	New Zealand, Radio NZ Intl	15720pa	
2200	2245	Egypt, Radio Cairo	6250eu	
2200	2257	China, China Radio Intl	7170eu	
2200	2300	Anguilla, University Network	6090am	
2200	2300	Australia, ABC NT Alice Springs	2310do	
		4835do		
2200	2300	Australia, ABC NT Katherine	5025do	
2200	2300	Australia, ABC NT Tennant Creek	4910do	
2200	2300	Australia, Radio Australia	11840va	13630va
		15230va 15240pa 15515as 17785va		
2200	2300	Belarus, Radio	6090eu	7360eu
2200	2300	Bulgaria, Radio	7400eu	9400eu
2200	2300	Canada, CBC NQ SW Service	9625na	
2200	2300	Canada, CFRX Toronto ON	6070na	
2200	2300	Canada, CFVP Calgary AB	6030na	
2200	2300	Canada, CKZN St John's NF	6160na	
2200	2300	Canada, CKZU Vancouver BC	6160na	
2200	2300	China, China Radio Intl	9590as	
2200	2300	Costa Rica, University Network	13750va	
2200	2300	Eat Guinea, Radio Africa	15190af	
2200	2300	Guyana, Voice of 3291do		
2200	2300	Liberia, ELWA	4760do	
2200	2300	Malaysia, RTM/Trax FM	7295as	
2200	2300	Nigeria, Radio/Kaduna	4770do	6090al
2200	2300	Nigeria, Voice of/ Ext. Svc Lagos	7255af	
2200	2300	Papua New Guinea, Wantok R. Light	7325va	
2200	2300	Solomon Islands, SIBC	5020do	9545al
2200	2300	Spain, Radio Exterior Espana	6125eu	
2200	2300	Spain, Radio Exterior Espana	9595af	
2200	2300	Taiwan, Radio Taiwan Intl	9355eu	
2200	2300	UK, BBC World Service	5955as	5965as
		5975am 6195as 9410af 9525am		
		9740as 15400af		
2200	2300	Ukraine, Radio Ukraine Intl	5830eu	
2200	2300	USA, American Forces Radio	4319usb	
		5446usb 5765usb 6350usb 7811usb		
		10320usb 12133usb 13362usb		
2200	2300	USA, KAIJ Dallas TX	9480va	
2200	2300	USA, KTNB Salt Lake City UT	15590na	
2200	2300	USA, Voice of America	5910va	7120va
		7220va 7405af 7425va 9490va		
		11725va		
2200	2300	USA, WBCQ Monticello ME	5110am	17495am
2200	2300	USA, WBCQ Monticello ME	7415am	9330na
		17495am		
2200	2300	USA, WBOH Newport NC	5920am	
2200	2300	USA, WEWN Vandiver AL	7560va	9975na
2200	2300	USA, WHRA Greenbush ME	7520af	
2200	2300	USA, WHRI Cypress Creek SC	9575am	
2200	2300	USA, WHRI Cypress Creek SC	7490na	
2200	2300	USA, WINB Red Lion PA	13570am	
2200	2300	USA, WRMI Miami FL	9955am	
2200	2300	USA, WRMI Miami FL	7385na	
2200	2300	USA, WTJC Newport NC	9370na	
2200	2300	USA, WWCN Nashville TN	7465na	9985na
		12160na 13845na		
2200	2300	USA, WWRB Manchester TN	12180va	
2200	2300	USA, WYFR/Family Radio FL	7305af	
		11740na 11875af 17690af		
2230	2257	Czech Rep, Radio Prague	5930na	9435af

2230	2300	Guam, AWR/KSDA	15320as	
2230	2300	Papua New Guinea, NBC	9675do	
2230	2300	Sweden, Radio	6065va	
2230	2300	USA, Voice of America	7230va	9780va
		15445va		
2241	2300	New Zealand, Radio NZ Intl	15720pa	
2241	2300	New Zealand, Radio NZ Intl	17675pa	
2245	2300	India, All India Radio	9705eu	9950as
		11620as 11645as 13605as		

2300 UTC - 6PM EST / 5PM CST / 3PM PST

2300	0000	Anguilla, University Network	6090am	
2300	0000	Australia, ABC NT Alice Springs	2310do	
		4835do		
2300	0000	Australia, ABC NT Katherine	5025do	
2300	0000	Australia, ABC NT Tennant Creek	4910do	
2300	0000	Canada, CBC NQ SW Service	9625na	
2300	0000	Canada, CFRX Toronto ON	6070na	
2300	0000	Canada, CFVP Calgary AB	6030na	
2300	0000	Canada, CKZN St John's NF	6160na	
2300	0000	Canada, CKZU Vancouver BC	6160na	
2300	0000	China, China Radio Intl	5915as	5990va
		6145na 7180as 11685as		
2300	0000	Costa Rica, University Network	13750va	
2300	0000	Cuba, Radio Havana	9505am	9550am
2300	0000	Guyana, Voice of 3291do		
2300	0000	Malaysia, RTM/Trax FM	7295as	
2300	0000	New Zealand, Radio NZ Intl	15720pa	
2300	0000	New Zealand, Radio NZ Intl	17675pa	
2300	0000	Papua New Guinea, NBC	9675do	
2300	0000	Papua New Guinea, Wantok R. Light	7325va	
2300	0000	Singapore, MediaCorp Radio	6150do	
2300	0000	Solomon Islands, SIBC	5020do	9545al
2300	0000	UK, BBC World Service	5965as	5985as
		9740as 11955as		
2300	0000	USA, American Forces Radio	4319usb	
		5446usb 5765usb 6350usb 7811usb		
		10320usb 12133usb 13362usb		
2300	0000	USA, KAIJ Dallas TX	9480va	
2300	0000	USA, KTNB Salt Lake City UT	15590na	
2300	0000	USA, Voice of America	5910va	7120va
		7405va 9490va 11725va		15185va
2300	0000	USA, WBCQ Monticello ME	5110na	7415am
		9330am 17495am		
2300	0000	USA, WBOH Newport NC	5920am	
2300	0000	USA, WEWN Vandiver AL	7560	v
		9975na		
2300	0000	USA, WHRA Greenbush ME	5850eu	
2300	0000	USA, WHRI Cypress Creek SC	11765na	
2300	0000	USA, WHRI Cypress Creek SC	7490na	
2300	0000	USA, WHRI Cypress Creek SC	11765na	
2300	0000	USA, WHRI Cypress Creek SC	7315am	
2300	0000	USA, WINB Red Lion PA	9265am	
2300	0000	USA, WRMI Miami FL	9955am	
2300	0000	USA, WTJC Newport NC	9370na	
2300	0000	USA, WWCN Nashville TN	5070na	7465na
		9985na 13845na		
2300	0000	USA, WWRB Manchester TN	12180va	
2300	0000	USA, WYFR/Family Radio FL	9430am	
		11740na 15400am		
2300	2305	Liberia, ELWA	4760do	
2300	2310	Croatia, Voice of Croatia	7285na	
2300	2315	Nigeria, Radio/Kaduna	4770do	6090al
2300	2315	USA, WYFR/Family Radio FL	11875af	
2300	2330	Australia, Radio Australia	9660as	11840va
		13690pa 15230pa 15240pa		17785va
		17795va		
2300	2330	USA, Voice of America	6180va	7205va
		15150va		
2300	2345	USA, WYFR/Family Radio FL	11740na	
2300	2345	Vatican City, Vatican Radio	7370am	
2300	2355	Turkey, Voice of	5960va	
2300	2356	Romania, Radio Romania Intl	6015va	
		6115va 7105va 9610va		
2330	0000	Australia, Radio Australia	9660as	11840va
		12080va 13690va 15230pa		15415va
		17750va 17785va		
2330	0000	Lithuania, Radio Vilnius	9875na	
2330	0000	Sweden, Radio	9800na	
2330	0000	UK, BBC World Service	3915as	5935as
		5965as 6170as 6195as		7105as
		7340as		
2330	0000	USA, Voice of America	6180va	7205va
		11655va 13640va		15150va
2330	2357	Czech Rep, Radio Prague	5930na	7345na

380-400 MHz LMR Frequency Update

Welcome to the first *Milcom* column of 2008. It has been a while since we have updated the Land Mobile Radio frequencies usage in the new Department of Defense subband. So let's kick the New Year off with an updated list that you can use to uncover possible trunk/simplex activity in your local listening area. The LMR frequencies below use the narrowband FM (NFM) mode.

Simplex Frequencies (7 freqs)

384.9750 385.3750 387.8500 387.8875
387.9375 388.6750 389.3250 MHz

Trunk Frequencies

(234 repeater output frequencies; inputs are 10 MHz higher)

380.0625 380.0750 380.1250 380.1750
380.2125 380.2750 380.3250 380.3750
380.3875 380.4125 380.4250 380.4375
380.4500 380.4625 380.4750 380.4875
380.5250 380.5375 380.5500 380.5750
380.6250 380.6625 380.6750 380.6875
380.7125 380.7250 380.7375 380.7625
380.7750 380.8250 380.8375 380.8625
380.8750 380.8875 380.9125 380.9375
380.9500 380.9750 380.9875 381.0125
381.0875 381.1125 381.1375 381.1500
381.1625 381.1750 381.1875 381.2000
381.2375 381.2750 381.2875 381.3125
381.3250 381.3375 381.4250 381.5625
381.6250 381.6750 381.6875 381.7375
381.7500 381.7750 381.7875 381.8250
381.8375 381.8500 381.8750 381.9250
381.9500 381.9750 385.0125 385.0250
385.0375 385.0625 385.0750 385.0875
385.1750 385.2125 385.3125 385.3250
385.3500 385.5125 385.5625 385.6250
385.6750 385.7000 385.7125 385.7250
385.7375 385.7500 385.7750 385.7875
385.8000 385.8375 385.8625 385.8750
385.8875 385.9000 385.9125 385.9250
385.9500 385.9625 386.0125 386.0375
386.0625 386.0750 386.0875 386.1000
386.1125 386.1250 386.1375 386.1625
386.1875 386.2000 386.2125 386.2250
386.2500 386.2625 386.2750 386.2875
386.3000 386.3125 386.3375 386.3500
386.3750 386.4125 386.4250 386.4375
386.4500 386.4625 386.4875 386.5000
386.5500 386.5625 386.5750 386.5875
386.6125 386.6375 386.6500 386.6625
386.6750 386.7000 386.7250 386.7375
386.7625 386.8000 386.8125 386.8250
386.8500 386.9125 386.9375 386.9500
386.9625 386.9750 386.9875 387.0625
387.1875 387.2250 387.2375 387.2500
387.2625 387.3375 387.3625 387.3750
387.4250 387.4375 387.4500 387.4625
387.4750 387.5000 387.5250 387.5375
387.5500 387.5750 387.5875 387.6375
387.6500 387.6625 387.6750 387.7000
387.7250 387.7500 387.7875 387.8250
387.8500 387.9250 387.9375 387.9500

387.9875 388.0000 388.0250 388.0375
388.1125 388.1375 388.1500 388.1625
388.1750 388.1875 388.2125 388.2375
388.2500 388.2625 388.3125 388.3375
388.3875 388.4125 388.5375 388.5500
388.5625 388.6750 388.7000 388.7250
388.7375 388.8375 388.8500 388.8875
389.0250 389.0750 389.1250 389.1625
389.1750 389.1875 389.2000 389.2125
389.2375 389.2875 389.3000 389.3375
389.3625 389.3750 389.4875 389.5250
389.5750 389.8375

Aeronautical Frequencies

Based on current monitoring and a detailed study of frequency assignments, the frequencies below will remain as aeronautical assignments. They all appear to be air traffic control (ATC) frequencies and the mode is amplitude modulation (AM). There are currently 37 such frequency assignments in this new subband.

380.0250 380.0500 380.1000 380.1500
380.2000 380.2250 380.2500 380.3000
380.3500 380.6000 381.4000 381.4500
381.5000 381.5500 381.6000 381.6500
382.0000 384.4000 385.4000 385.4250
385.4500 385.5000 385.5500 385.6000
385.6500 387.0000 387.0250 387.0500
387.1000 387.1500 388.2000 390.8000
391.9000 392.0000 392.1000 397.8500
397.8750 397.9000

Command and Control Frequencies

Some of the aeronautical frequencies in this new DoD subband will be service command and control assignments. Like their ATC cousins above, these frequencies use the AM mode.

380.7000 381.0000 381.1000 381.3000
381.3500 384.5000 385.0000 385.0500
385.2000 385.5250 386.0000 388.9500
389.0000 392.2000 395.1500 396.9000
398.1000

We have now identified the usage of 529 frequencies out of 1600, or about 33 percent of the frequencies in this new DoD subband. We will continue to report on our frequency findings in this column as new information becomes available.

❖ U.S. Army Trunk Systems

This month we will present Part 2 of the U.S. Army trunk radio systems. All the systems listed at the bases below are Motorola trunk radio systems unless otherwise noted.

Fort Greely, Alaska (System: EDACS Regular)

407.5500 (LCN01) 406.5500 (LCN02)
406.7500 (LCN03) 406.9500 (LCN04)
408.1500 (LCN05)

Fort Huachuca, Arizona

406.3625c 406.7750c 407.5625 407.8875c
408.1000 408.4250c 408.7625 409.1250
409.3250 409.3500 409.6375

Fort Huachuca, Arizona (Project 25)

408.7625c 409.5125 409.6875c 409.7125
410.1250

Fort Irwin/National Training Center, California (System: EDACS)

406.5500 406.6500 406.7750 406.8500
406.9500 407.0750 407.4250 407.5500
407.6250 407.9500 407.9750 408.0250
408.1500 408.3500 408.5500 409.0750
409.1500 409.4500 409.5500 409.7500
409.9500

Fort Jackson (Columbia), South Carolina

Site 6 406.3625c 406.7625c 407.7625c
408.1625 408.3625c 409.3625 410.1625
410.5625

Site 7 406.5625 407.1625c 407.3625c
410.7625c

Another possible trunk system: 406.5625 406.7625
407.7625 409.3625 410.1625 410.7625

Fort Leonard Wood, Missouri

Site 1 406.1625c 406.5625 406.9625 407.3625
407.8125 408.1625 408.5625 408.9625
410.1625 410.5625

Site 2 406.3625c 406.7625 407.1625c
407.5625 407.9625 408.3625 409.5625
409.9625

Site 3 408.0875 408.4250c 409.1125c
409.3625c 409.7625 410.3250
410.7625

Fort Lewis, Washington

406.1250 406.9500 407.1250 407.2500
407.3000 407.4750 408.1000 408.5500
409.1500 409.3500 410.1500

Note: The operational status of this system is unknown as of presstime.

Fort Meade, Maryland

406.3250 407.4000 407.5750 409.4500

Fort Polk, Joint Readiness Center, Louisiana (System: EDACS)

Site 1 406.3500 406.7500 407.1500 407.3750
407.4750 407.9500 408.1500 408.4750
408.5750 408.7500 408.9500 409.1500
409.3250 409.5500 409.7500
409.9500

Site 2 406.3500 406.5500 406.7500 407.1500
407.3500 407.4500 407.9500 408.0500
408.1500 408.5500 408.7500 408.9500
409.1500 409.5500 409.7500
409.9500

Site 3 407.1750 407.3250 407.4250 407.5250
408.0250 408.1750 408.4250 408.5250
408.6250 409.0250 409.1250 409.2250
409.3000 409.3500 409.4750 409.6000
409.8500 410.0000

Fort Richardson, Alaska System: EDACS Standard

406.3500 (LCN01) 407.1500 (LCN02)
407.9500 (LCN03) 408.7500 (LCN04)
409.5500 (LCN05) 410.2000 (LCN06)
408.3500 (LCN07) 408.9500 (LCN08)
409.1500 (LCN09) 409.7500 (LCN10)

Fort Riley, Kansas (System: EDACS Standard - ProVoice and Analog)

406.1625 (LCN01) 406.7625 (LCN02)
407.7625 (LCN03) 407.5625 (LCN04)
409.5625 (LCN05) 410.3625 (LCN06)

410.7625 (LCN07)
Fort Stewart/Hunter AAF, Georgia
 Site 1 406.1125c 406.9625 407.2500
 407.5000 407.7625 409.3500 [Fort
 Stewart]
 Site 2 406.5000c 407.5625 408.1250
 408.3625 [Hunter AAF]
 Site 3 407.3500c 408.0250c 409.1250
 410.6500 [Richmond Hill]
 Site 4 407.1625c 407.4250c 407.8625
 410.1500 410.3625 [Pembroke]
 Site 5 408.1500c 408.5625c 409.0250
 409.3000 410.3250 410.5625 [Glen-
 ville]
Fort Wainwright, Alaska (System: EDACS
 Standard)
 406.350 (LCN01) 407.150 (LCN02) 407.950
 (LCN03) 408.750 (LCN04) 409.550 (LCN05)
Pine Bluff Arsenal, Arkansas
 407.2250 407.2750 407.4000 407.5000
 407.5750 412.8500 414.7250 416.4250
 417.6500 419.1500
Redstone Arsenal, Alabama
 406.2375/415.2375c 406.4375/415.4375
 406.8375/415.8375 407.0375/416.0375c
 407.2375/416.2375 407.6375/416.6375c
 407.8625/416.8625 409.0250/418.0250
Tooele Army Depot, Utah
 406.3500/415.1500 407.1500/415.9500
 407.9500/416.7500 408.7500/417.5500
 409.5500/418.3500
Umatilla Army Chemical Depot, Oregon
 416.5625 419.1625 419.3625 419.7625
 U.S. Army Corps of Engineers, Carlyle, Illinois
 406.3500 407.1500 407.9500 409.1500
Yuma Proving Ground, Arizona
 407.1500 407.9500 408.7500

❖ HF Military Frequencies

I had quite a few nice comments about the HF military frequencies printed in previous Milcom columns. If you want my current and complete by-frequency list of HF military communications frequencies, you can download it from the *MT* readers-only section of the *Monitoring Times* internet website. So, for those of you who chase military comms in the shortwave spectrum, here is our third installment of HF Milcom frequencies.

French Military (STANAG 4285)
 4644.8 5217.5 6345.0 7556.4

French Air Force
 Voice Networks (USB)
 3150.0 6688.0 6699.9 6712.0 6843.0

French Army
 FAV22-Mont-Valerien CW
 3881.0 4411.0 4856.0 5189.5 6825.0
 Voice Networks (USB)
 11518.0 13479.5 14670.5 14841.5

French Forces (ARQ-E3)
 7895.6 Reunion
 10626.0 RFFXL-Naqoura, Lebanon
 16014.2 Le Port, Reunion

French Navy
 VLF 200/90 PSK
 21.75 HWN-Le Blanc, France
 65.80 FUE-Brest, France
 FUB/E - Brest (RTTY 850/50)
 2064.0 4338.0 8565.0 12015.0 (Encrypted)
 12730.0 16966.0
 STANAG 4285
 6348.0 (600L 5N2) 8453.0 (300L 5N1) 8568.0
 (330L 5N2) 12666.5 (300L 5N1) 22447.0
 300L 5N2)
 Armor-CCMAR/ATL Brest USB
 5758.0

Russian Air Defense PVO Net (CW)
 4391.0 (ID=9) 4496.0 (ID=0 and ID=8)
 4951.0 (ID=0) 5313.0 (ID=9) 5772.0 5918.0
 6823.5 (ID=9) 7994.0

Russian Long Range Air Force
 REA4-Headquarters Moscow 800/50 REVS
 3531.0 7959.0

Russian Army
 6881.0 (USB)

Russian Military
 36-50 digital mode
 3259.0 3530.0 8006.0
 81-81 digital mode
 3161.0 3350.1 3566.5 3807.0 5066.5
 5082.0 5157.4 5207.5 5404.0 5809.0
 MS-5 digital mode
 3235.0 3461.0 3602.0 4765.0 5062.0
 5140.0 5152.0 5319.0 5392.0 5805.0
 6920.0 7704.0 8701.5 10464.0 14232.0
 14458.0
 RUS-75 digital mode
 10215.0 10374.0
 RUS-SYS digital mode
 5796.0 5864.0 6846.0 7527.0
 Morse code (CW)
 3364.0 3382.0 3397.0 3811.0 5252.0
 5322.0 5407.0 6767.0 6844.0 6988.0
 7969.0 7980.0 11465.0

Russian Navy
 Beacons (Enigma MX CW mode)
 C Beacon Moscow
 13528.0 16332.0
 D Beacon Sevastopol Ukraine
 4557.7 13527.7 16331.7 20047.7
 F Beacon Vladivostok
 7039.2
 K Beacon Petropavlovsk-Kamchatskiy
 7039.3 8495.3
 M Beacon Magadan
 7039.4 8495.4
 P Beacon Kaliningrad
 3291.0 4031.0 4043.0 4476.0 4635.0
 4828.0 4899.0 5691.0 5856.0 5862.0
 5982.0 7038.8 8494.8 10871.8
 R Beacon Ustinov
 5467.7
 S Beacon Severomorsk
 4557.9 5153.9 10871.9 13527.9 16331.9

Morse code (CW) traffic
 Station List:
 NOVATOR/RJC38-Murmansk Air Transport
 Northern Sector
 PRIBOJ/RFJ94-Moscow Air Transport Central
 Sector
 RCP-Black Sea Fleet HQ Sevastopol, Ukraine
 RCV-Sevastopol
 RIT-Northern HQ Fleet Severomorsk
 RIW-Russian Naval Headquarters Moscow
 RKN-Astrakham
 RMP-Baltic Fleet Naval Headquarters Kalinin-
 grad

3850.5 (RMP) 5213.0 (RMP) 5224.0 (RCV)
 5232.0 5400.5 (RKN) 5751.0 (RIT) 5753.0
 (RIT) 5775.0 (RCP) 6836.0 (RMW56/RMW32)
 6873.0 (RMP) 8058.0 8345.0 (RMP) 8536.0
 (RIW/RMP) 8816.0 (PRIBOJ/RFJ94 and NOVA-
 TOR/RJC38) 9145.0 (RIW) 9595.0 (Tactical Net)
 10535.0 10683.0 (Tactical Net) 10747.0 (RIW)
 11000.0 (RIW) 12162.0 (Tactical Net) 14556.0
 (RIW)

UK TASCComm Net (ALE/USB)
 2217.3 2705.0 5270.0 13423.5 13490.0
 13499.0 16350.0

UK RAF Flight Watch/TASCComm (USB)
 4742.0 5436.0 5702.0 6697.0 6739.0
 9031.0 11247.0 13257.0 18018.0

US Armed Forces Network (USB)
 4319.0 (Diego Garcia) 5446.5 (Key West)
 5765.0 (Barrigada) 6350.0 (Lualualei)
 7811.0 (Key West) 10320.0 (Lualualei)

US Coast Guard
 4235.0 (FAX) 5320.0 (ANDVT/USB) 5696.0
 (ANDVT/USB) 5699.0 (ANDVT/USB) 6215.0
 (ANDVT/USB) 6234.5 (ANDVT/USB) 6316.0
 (SITOR-B/CW) 6340.5 (FAX) 8301.6 (AND-
 VT/USB) 9001.6 (ANDVT/USB) 12592.5
 (SITOR-B/CW) 16812.5 (SITOR-B/CW)

US DoD MARS
 3370.6 (USAF-USB) 4011.0 (USN/MC-USB)
 4036.0 (USA-USB) 4041.0 (USN/MC-USB)
 4516.3 (USN/MC-PACTOR) 4518.6 (USAF-
 Piccolo) 5401.0 (USA-PACTOR-1) 7540.0
 (USAF-MFSK16) 13993.1 (USAF-USB)
 14606.1 (USAF-USB)

US DoD SCR Net (ALE/USB)
 4950.0 7990.0 10800.0 12090.0 14550.0
 14550.0

US National Guard (ALE/USB)
 4562.0 (VA) 5125.0 (VA) 5209.5 5434.0
 (NY) 5436.0 (IN) 5778.5 5851.5 6911.5
 (PA) 8037.0 (VA) 9036.0 9143.5 (VA)
 9295.0 (NY) 14653.0 (STARC Nationwide)
 16023.5 (NY) 19233.5 (Nationwide)

US Navy
 2252.0 HF-CWC (BF) USS Eisenhower Link 11
 Voice coordination net USB
 3038.0 HF-CWC USS Harry S. Truman CSG
 USB/ANDVT
 4081.5 HF-CWC Coordination net USB
 4360.0 HF-CWC Air Defense Commander Net
 USB
 4449.0 HF-CWC (HW) USS Kearsarge ESG Air
 Defense Network USB
 5399.0 HF-CWC (EW) USS Enterprise CSG Air
 Defense Voice Coordination Net USB
 5412.0 HF-CWC (possible multi-national) CWC
 Link 11/16 coordination net (USB)
 6746.4 SPAWAR SIDL [tentative] USB/ANDVT
 7703.0 Trigraphs with EAM traffic USB
 8977.0 Tactical Support Center (TSC) - Pa-
 cific, NAS Whidbey Island, WA Habitat
 USB

USSTRATCOM EAM Restoral Frequencies
 (USB)
 6697.0 8776.0 11244.0 13155.0

Miscellaneous US Military HF Frequencies
 3204.0 US Air Force Civil Air Patrol ALE/USB
 [tentative]
 4283.0 US DoD Military STANAG 4285
 4443.5 US Army Aviation/National Guard
 CONUS Net ALE/USB
 4506.0 US Air Force Civil Air Patrol USB
 5345.0 US DoD Military 75 baud STANAG
 4481
 5389.0 US Marine Corps 26th Marine Expedi-
 tionary Unit - Djibouti ALE/USB
 5662.7 US Army Serbia ALE/USB
 5711.0 USAF Search and Rescue Aircraft
 Air-to-Air/HF Guard
 6405.0 US DoD Puerto Rico STANAG 4285
 7986.5 US Marine Corps 26th Marine Expedi-
 tionary Unit - Persian Gulf ALE/USB
 8050.0 US Army Fort Bragg MC SOAR/JSOC
 ALE/USB
 11220.0 US DoD Airborne Command Post Data
 duplex frequency with 11460 kHz
 Data/USB
 11402.0 US Air Force Civil Air Patrol ALE/USB
 15082.0 US Civilian Contractor Rockwell SCOPE
 Command Facility Dallas, TX ALE/
 USB

And that does it for this first column of the
 New Year 2008. 73 to all and good hunting.

Topping Off the New Year

A Happy New Year to all the *Monitoring Times* and *Fed Files* readers. It's hard to believe another year has sped by, but let's jump in to 2008 by wrapping up some old business, as well as peeking at some new technology, new radios and new frequencies!

❖ TOPOFF 4 Recap

In October of 2007, the Department of Homeland Security sponsored a multi-city exercise called TOPOFF (Top Officials) 4, which involved several fictional scenarios of terrorist attacks on American cities. One of the cities involved in this exercise was Portland, Oregon.

The weekend prior to the exercise, several interesting aircraft flew in to Portland International airport (KPDX), including several chartered air cargo planes, as well as what appeared to be an E-6B Mercury TACAMO aircraft. Several marked trailers and trucks from the Environmental Protection Agency's Radiation and Indoor Environment National Laboratory in Las Vegas, Nevada, were staged at various places around the simulated terrorist attack site with what appeared to be air sensors deployed. All of the EPA trucks and trailers appeared to have VHF hi-band radio antennas on board.



The Federal Emergency Management Agency had several mobile command post type vehicles staged in the Portland area, and there were some marked SUVs seen driving around town sporting antennas for all radio bands, including HF and satellite. FEMA was utilizing 138.2250 MHz, P-25 for their operations at the TOPOFF command center in downtown Portland. Various Federal Protective Service units were operating on the Portland 417.2000 MHz P-25 repeater for their part of this exercise.

The primary communications pipeline



appears to have been the local 800 MHz public safety trunked radio system operated by the Portland Bureau of Electronic Communications. Many emergency operations' talk groups were very busy on this system during the week of TOPOFF, with traffic related to the exercise and the logistics surrounding it. Some TOPOFF related traffic was also heard on the National Public Safety Planning Advisory Committee (NPSPAC) 800 MHz mutual air repeaters as well.

Federal agencies were heard making use of some conventional systems as well as the federal Integrated Wireless Network (IWN) trunk system. Simplex traffic was heard on 167.3875 MHz, P-25 at the main exercise event, located near the Portland International Raceway. I am guessing they were Federal Bureau of Investigation agents assigned to the investigative phase of the exercise.

The IWN VHF P-25 system has six sites located in and around the Portland area. While most of the traffic was encrypted, I was able to watch the system activity using the PRO96COM software package, and I did note a lot more radios affiliating or logging on to the IWN system than normal.

Not only were federal agencies seen participating at the TOPOFF exercise, but military hardware was being employed as well. Pictured below is a mobile unit from the 5th Army Group that appears to be a VSAT terminal as well as having multiple land-mobile antennas.



Surprisingly, I never saw any messages or posts from folks in Phoenix, Arizona, where another part of the TOPOFF exercise was held, so I have no idea what the exercise communications were like there!

❖ Federal Frequency Sources

In the November *Fed Files*, I touched on the subject of where to find federal frequency listings. Since that column appeared, I have received some information about regional frequency directories that do contain confirmed and accurate federal listings.

A longtime contributor to *Monitoring Times* and *Satellite Times* magazines, John Wilson has begun to offer his W4UVV *Virginia Frequency Guide* on CD-ROM. The frequency guide contains over 90,000 listings and covers all services, including aviation, business, marine, military, public safety and federal frequencies for the state of Virginia. The latest edition is now available directly from the author. You can contact John Wilson for more information on ordering his Virginia frequency directory by sending him an email at w4vuuv@amsat.org.

If you know of any other state or regional frequency directory that covers the federal bands, please let us know at the *Fed Files*.

❖ What the Heck is an NAC?

One of the methods that listeners sometimes use to help identify federal users is the Continuous Tone Controlled Subaudible Squelch, or CTCSS tones. These subaudible tones are used on analog radio systems to minimize the potential for interference or from users on adjacent frequencies, or users of the same frequency located at a distance. Many federal frequency lists contain this CTCSS tone information and sometimes it can be used to identify which agency might be using a frequency, since many agencies will use the same tone throughout their radio systems.

The ability to use this subaudible tone information to identify users does not exist on digital radio systems. These systems do not use tones, but instead use a small bit of code in the data stream that contains the digitized voice information. This code is referred to as a NAC, or Network Access Code. The NAC allows radio system to only accept incoming signals from radios using the correct NAC.

Conventional digital systems as well as digital trunked radio systems can use NACs to control access to the repeaters by units in the field.

Until recently, no one in the scanner world could do anything with this NAC data. But late in 2007, the Japanese scanner manufacturer GRE started offering some new digital scanner models that would decode and use the NAC information on digital radio systems. Both the PSR-500 and PSR-600 radios allow users to assign a Network Access Code to any P-25 conventional channel. You can see more about the GRE digital scanners at the Grove web site: www.grove-ent.com/grepape.html

There are also some software solutions that allow you to monitor NACs using a PC and scanner. The "Unitrunker" software package (<http://wiki.radioreference.com/index.php/UniTrunker>) has a function called "kNACK." This program will read the NAC codes from a scanner monitoring a P-25 digital signal.

One difference between the use of a PL tone and an NAC is that you cannot use an NAC setting on the scanner to eliminate hearing encrypted traffic. On analog radio systems using encryption, the squelch tone is not transmitted during encrypted traffic. This enables a scanner listener to set a CTCSS squelch tone on a particular channel, and the scanner will not stop on that channel if the radio traffic is using encryption. However, on conventional P-25 radio systems the NAC is transmitted regardless of the encryption of the voice data. So you won't be able to block out encrypted channels by using the NAC function.

Some federal listeners have already started monitoring and logging various agency NACs from across the country. In some cases there has not been consistent use of a particular NAC code by a particular agency. In other cases, agencies appear to have chosen NAC codes that reflect a numeric reference to their old analog CTCSS tone. For example, some have noted a NAC (denoted by \$) of \$167 used by an agency that used to utilize a PL tone of 167.9 Hz, or a NAC of \$156 for the DEA P-25 radios, instead of a CTCSS tone of 156.7 Hz. By the way, NAC values are usually expressed in hexadecimal, and I'm sure that many frequency listings will soon start showing NAC values on P-25 frequencies.

❖ Atlantic City Federal Scanning

I have had a few occasions to travel to the Atlantic City, New Jersey, area for work. While there, I usually try to search out any federal radio traffic in the area. Because of its location to the Philadelphia area, some traffic from Philly can be heard in the Atlantic City area. And if I'm lucky enough to get a hotel room at one of the high-rise casino hotels, I can usually pick up traffic from all over the state.

Freq	CTCSS/DCS Tone or Type	Agency
163.4375	107.2	Unknown agency
163.7125		Unknown agency, weak signal into At-

164.1000
164.8000 D565
166.0375 131.8
167.2125 167.9

169.9500 D412
170.4250 P-25
170.7125
170.7625

170.7750 114.8
171.2375 118.8

171.7125 D664

172.9000 D315

173.8375 D664

406.8125 P-25
407.5625

408.1625 118.8
408.7500 123.0
409.7625 CSQ
409.9375 P-25

412.0000 P-25

412.0500

418.9000 P-25

409.9625 156.7
409.7375 114.8

CSQ = Carrier Squelch
CTCSS = Continuous Tone Control Squelch
DCS = Digital Coded Squelch

Regarding 172.9000 MHz - This frequency was once part of the Federal Aviation Administration's National Radio Communications System (NARACS), but was split off for use by the Transportation Security Administration when they became part of the Department of Homeland Security in 2002. I was interested to hear it still in use by the FAA at the Tech Center at the Atlantic City airport. It sounded like it was mainly an administrative channel with only occasional use.

How did I know it wasn't the TSA? Because all the transmissions I monitored were using analog and the TSA has consistently been using P-25 digital for all of its radio operations.

Atlantic City
Unknown agency
Unknown agency
Unknown agency
FBI analog repeater,
not sure of the loca-
tion
Unknown agency
Unknown agency
Unknown agency
EDACS trunk-
ing control channel,
NASA Wallops Is VA
Site 2, LCN 1. This
was the mysterious
EDACS trunked sys-
tem that was being
picked up all up and
down New Jersey for
a while last summer.
Not much is known
about this system
yet, and official in-
formation is simply
not available.
Unknown agency
Atlantic City Interna-
tional (KACY) - Fire
Alerts
Input 173.8375 re-
peater
FAA Tech Center at
KACY (see below)
Fire & EMS at Atlantic
City International
Airport KACY
Unknown agency
Motorola trunk-
ing control channel
a73b - Unidenti-
fied federal system
in Washington DC
area.
Unknown agency
Unknown agency
Unknown agency
USPS Postal In-
spectors "Ida" units,
Philadelphia
DEA Brigantine, NJ
repeater
Motorola trunking
control channel Sys
ID 2305, Patuxent
River NAS
DEA repeater, loca-
tion is unknown
Unknown
Unknown

❖ Federal Reserve System Radios

A trend seems to be emerging with regard to new radios being used by branches of the Federal Reserve Bank. I have received word from listeners around the country that new frequency pairs are being used. To see where the Federal Reserve Banks and their branches are located, you can check these links:

www.federalreserve.gov/otherfrb.htm
www.federalreserve.gov/branches.htm

The new frequencies being used are 415.6625 MHz and 406.6625 MHz. These frequencies became available for use after the re-shuffling of the federal UHF band to accommodate narrow banding and 12.5 kHz channel spacing. It also shows the new National Telecommunications and Information Administration (NTIA) specifications that set a 9 MHz offset for repeater input and output channels. This will be the standard repeater offset in the federal UHF band from now on. Some older systems and UHF trunk systems are not yet using this offset, but any new repeater systems are supposed to use this plan. The offset can be in either direction, so some systems may use a repeater with a +9 MHz input and some may use a -9 MHz input.

One interesting note on the new Federal Reserve radios is they do not seem to have been set up in the same mode. Some are P-25 repeaters, some are analog with a CTCSS tone, and some use a DCS squelch. So it appears that each branch contracted for the radio system design and installation with only the frequency pair as a standard!

So far here are the cities I have confirmed using the new radio frequencies:

Houston	406.6625 MHz, P-25 re- peater
Boston	406.6625 MHz, 156.7 analog repeater
Dallas	406.6625 MHz, P-25 re- peater
San Francisco	406.6625 MHz, D074 analog repeater
Los Angeles	406.6625 MHz
Memphis	415.6625 MHz, D546 sim- plex
Miami	406.6625 MHz, 103.5 re- peater

If you are hearing anything on 406.6625 or 415.6625 MHz in your area, please let us know.

That's all for the start of 2008, but we'll be back with more in March!

MT READERS ONLY

To access the restricted web-site for the month of January, go to www.monitoring-times.com, click on the key, and when prompted, enter "mtreader" under the user name. Your password after December 31 is "energy" - Check in the first of each month for new material.



Winter on the Water

The temperature has dropped to freezing and there is a gale blowing outside. The furnace is running and there is a hot cup of coffee on the desk. The VHF radios and the scanner are monitoring marine and emergency traffic. VBR Prescott has just announced the Lake Ontario forecast with a Gale Warning in effect. The HF receivers are tuned to marine traffic. Sydney Coast Guard radio has just given the weather on 2749 kHz. The 80 meter amateur nets are active again. VE3MUD is reporting the weather on 2m as he travels home. What more could a radio enthusiast ask for? It is a perfect evening for finishing my column while monitoring the bands.

The famous Gales of November on the Great Lakes have arrived: We have already had two Gale Warnings for Lake Ontario. The local continuous marine broadcast on channel 83B has forecast winds of gale force, 35 knots plus, beginning this evening, with waves of three meters in height. Snow has been mentioned in the long-range forecasts for Kingston, Ontario, and Watertown, New York.

The cruise ship *Canadian Empress* has already begun winter lay-up and will move to its winter berth shortly. Since this area freezes up, air bubbling systems and water agitators must be installed around the ships to prevent ice damage in the winter. Another winter reminder is from the *CCGS Caribou Isle*, on channel 82A. She was doing season-ending navigation aids work in the area. The lighted buoys at Quebec Head have been decommissioned for the season. The vessel is secured in Kingston and has reported winds from the South at 25 to 30 knots. VHF Channel 82A is used for communications between Coast Guard vessel and VBR Prescott radio. All the yachts have been pulled from the water so there is little VHF traffic beyond the commercial vessels and local ferries.

8983 kHz and 5696 kHz just came alive with

CAMSLANT Chesapeake handling two searches at the same time. CG 2110 was diverted to an AIS (Automated Identification System) alert of a vessel in trouble off of Marsh Island, near New Orleans, with 39 people on board. CG 2128 was assigned to a search off the Coast of Haiti for a 55-year-old male in the water.

As the local traffic dies down, these two frequencies and the Canadian Search and Rescue frequency of 5717 kHz will be monitored more frequently here. I was also monitoring the 6501 USCG weather broadcasts as Tropical Storm/Hurricane Noel worked its way towards the Canadian Maritime Provinces. As the daylight hours shrink here, the HF frequencies become more active and the range increases. I look forward to hearing Point Reyes California and Kodiak Alaska soon.

I also monitor the 2 MHz marine frequencies here. Canadian east coast stations on 2182 are often heard. 2598 and 2749 are used for weather broadcasts after being announced on 2182. Of course, ZBR Bermuda broadcasts are monitored on 2582 kHz at 0035Z and every four hours after that.

❖ Low Frequency DX

I said I would try to give some good frequencies for DX this month. Let's start with a trivia question and a real DX challenge: What is the closest European country to Canada? You might win a few bets with this one: The answer is France.

Remember that after the Seven Years War, France gave all of New France to the British as the spoils of war; all they asked to retain were the two small islands of St. Pierre and Miquelon, which are about 25 miles off the coast of Newfoundland. These are still French territory today.

Now for the DX! There is a low frequency beacon on St. Pierre and Miquelon. It is on 386 kHz and has the CW identifier of SP. This should be a great catch for low band DXers.

❖ Historic Maritime Radio Rejuvenated

One station I plan to monitor this winter is the historical KPH, run by the Maritime Radio Historical Society. Two historic Press Wireless transmitters (PW-15) were rescued from the Palo Alto, California, site and installed at the KPH/KFS site in Bolinas, CA.

One of these vintage rigs is used on 12993

kHz. As a true historian/engineer, Steve Hawes replaced the solid state rectifiers with 872 Mercury vapor rectifiers he collected and tested. The rig went on the air on June 2, 2007. Of course, the Night of Nights, commemorating the last Marine Morse message, saw many classic transmitters on the air on July 12. Calls included KPH, KFS, KSM, NOJ, WLO, KLB and NMN on the air on CW. It must have taken a great effort to get the USCG station at NMN back on the air.

During the event, K6KPH was also active on the amateur bands, so amateurs could contact the station and give reports on the marine activities. They are usually on 7050 and 14050 CW.

KPH transmits on 426, 500, 4247, 6477.5, 8642, 12808.5, 17016 and 22477.5 kHz. KFS transmits on 12695 and 17027 kHz, while KSM transmits on 426/ 500/6474 and 12993 kHz. All stations listen on 500, 4184, 6275, 8368, 12552, 16736, and 22780.5 kHz.

On August 4th, KSM tested their 12 MHz RTTY transmitter on 12631 kHz. Fec and 45 bd Baudot were used. 8443 at 170 cps (characters per second) is also now active.

To keep up to date on the schedules and tests, you can visit the MRHS website at www.radiomarine.org. You can even be put on their list for email notices for transmissions. I want a QSL from these stations on my wall by spring! Thanks to Richard Dillman, W6AWO for the updates. You can also contact KPH via Skype on your computer. Use *radio-ksm* for the Skype address.

Many marine operators want to preserve 500 kHz as an historic frequency because of the commercial Morse operations there. According to the MRHS, you can do this by applying to the FCC to establish your own class 1A Commercial Coast Station. All you have to do is pick the right frequencies, check the right boxes on the FCC form 601, and pay the filing fee. This can even be done on line. If all goes well, you will have a license with a 10-year term and a 3-letter call. The trick is to cause the FCC as little trouble as possible. All the frequencies are still in the FCC rules, so if you select carefully you should have little problem. It is recommended that you apply first for an MF frequency, 500 kHz, and a working frequency. If the working frequency is licensed to a coast station (WCC, WLO, etc.), you can get a letter of agreement, as they no longer use MF.

At a minimum, you must have a second class radio telegraphy certificate to operate a commercial station; however, operating your station will allow you to accumulate the one year experience to write the first class radio telegra-



MV Canadian Empress. I worked 28 days as mate aboard her this summer.

phy exam. Unfortunately, military and amateur experience does not count.

For those who think this is not possible, James A. Dalke, of Bellevue, Washington, has been issued the license KDR. He is a broadcast engineer and has a 5 kW transmitter in his garage. He has been issued 482 and 500 kHz for operations. WFT, in Florida, has also been licensed to use the same frequencies. Operation was scheduled to begin in September. Who said 500 kHz and CW was a thing of the past?!

Congratulations are also in order for Denise Stoops, the first female telegraph operator at KPH. She has recently upgraded to the first class operator's certificate. Twenty years of operating experience certainly has qualified her for this. As a result, she is also operating on the *SS Jeremiah Obrien*, a WWII liberty ship that uses San Francisco as a homeport. When the ship cruises, Denise, who signs DA on CW, operates the vintage transmitter under the callsign KXCH.

❖ British Columbia

I always enjoy hearing from John Musgrave of Oona River, British Columbia. Traveling by sailboat into remote regions of the BC coast provides many interesting radio opportunities as well as a great deal of marine information and great pictures.

John reports commercial marine traffic control in the Prince Rupert area on channel 11, and a lot of sport fishing traffic on channel 77. He heard the boats talking about a lot of ping-pong balls in the water and on the beach. Apparently, a container of them was swept off a ship and provided some interesting beachcombing. A few years ago, two containers of Nike air cushion shoes washed overboard; John said he found many pairs but none to fit him.

As for HF information, John reported the Great Northern Boaters Net on 3870 kHz at 0800 PST. Darlene, KL0YZ, from Alaska, controls the northern section of this net. As summer came to a close and the last southbound vessel came south of Cape Caution (or "around the bend"), the northern section of the net shuts down.

John logged a marine net on 4146 USB at 0300Z, and also a New Zealand station with

weather on the same frequency. Canadian weather from VMW was copied on 2056 kHz. He also reported monitoring a Buffalo aircraft on 5717 with 6694 as the backup frequency. He said that RTTY activity on 6715 USB indicated that these aircraft were airborne. Some unidentified traffic on 4703 kHz was also heard.

John uses a Lowe H150 along with AOR 8200 and 8600 receivers during his travels.

❖ Cruising the East Coast

Another person who wrote was Bill Dunn, NIKUG. He liked my ZBR Bermuda article and gave me a heads up on the UHF frequencies used aboard ships. These frequencies provided interesting listening as my wife and I cruised the east coast of Canada and the US on the *Norwegian Dawn* from late Sept. to early Oct. Most of the communications were in the 450 to 470 MHz region.

Bill also gave me frequencies in the Boston area. Channel 20 is used to talk to the pilots for the harbor. It is a repeater and has great range. I heard the pilot request a ladder on the port side and thus got some good pictures of the pilot boat as we entered the harbor. (Another example of using radio to aid other hobbies!)

It was great to chat with Bill on the Quincy repeater (146.670, -600, 146.2 tone). While ashore in the Quincy market I talked to Wendell K1LWI. Back on board, I listened on 467.750 and heard we had to wait for a container vessel to arrive before we could depart.

Being a radio enthusiast, it did not take me long to notice that the marine VHF radio in the tenders we used when the ship had to anchor off a port was tuned to channel 77. Halifax harbor uses channel 12 for ship control traffic. Channels 11, 12, and 14 are used for ship traffic control in the St. Lawrence River and Gulf area. Channel 9 was used for Escoumain CG radio.

While in Halifax I used their repeater to make an IRLP (Internet Radio Linking Project) call back to Kingston. VE3XJS, Jim, answered and brought me up to date on the news from home.

My visit to Cornerbrook was the first time I have been to Newfoundland, but it will not be my last. Weather channel 1 and marine channel 83b gave the weather forecasts for this area. I also had a chat with Daryl VO1AV on the VO1CBK, 146.940, repeater.

I did not do much HF monitoring. I did hear CHU on 7335 kHz or 3330 kHz and WWV on 5 and 10 MHz. Of course, CAMSLANT Chesapeake came in on 5696 and several Canadian CG radios came in on 2182, etc. I did hear Bermuda on 2582 kHz as well.

❖ Challenges

I have done some searching and found a few HF frequencies to try for this winter. I am still looking for reception on the 8167 USB navigation warning channels from Australia. Perhaps some West Coast readers have had success and more information on this channel. I have heard

John Musgrave's SV Alamain in Klekane Cove showing the 20 foot Shakespeare vhf antenna at stern and the wire antenna to the masthead.

CHANNELS AND FREQUENCIES:

Channel 9	156.450
Channel 11	156.550
Channel 12	156.600
Channel 14	156.700
Channel 77	156.875
Channel 82A	157.175

USCG New Orleans weather on 12788 at 1534Z and USCG Point Reyes, California, on 13084 at 1637Z.

I noticed a listing for WAH in the US Virgin Islands that might be a potential catch: 4357 kHz receive, 4065 kHz transmit. A broadcast at 0600Z and every 6 hours thereafter was also noted.

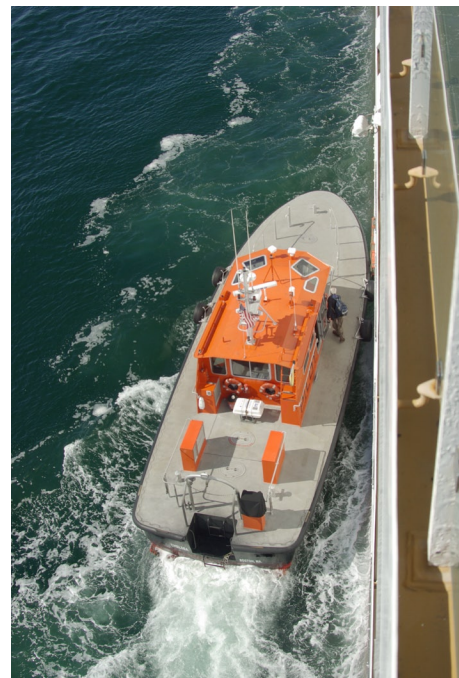
The Northwest Caribbean Cruisers Net at 1400Z on 6209 or 6212 kHz and the Panama Canal Connections net at 1300Z on 8107 kHz are listings to be investigated.

Kingston Jamaica has a broadcast listed for 0830 and 1330 local time on 2738 kHz and 2527 kHz is also listed. Belize is also said to use 2182 and 2750 kHz.

Another cup of coffee has been delivered and all the radios have traffic on them. As I listen, I am reminded that this hobby leads to lifelong friends. George Kennedy, VE3GHK and I have been listening and discussing radio signals for nearly 50 years now. I guess sitting here at the radio desk reminds me of many hours listening to a Hallicrafters S-38 connected to a long wire antenna. We now chat on 2m VHF radio and email, where we used to phone each other. George and I also plan to revisit VBR Prescott radio and deliver copies of the magazine and color copies of the electronic article from the October issue of *MT*. Several of the operators have seen the article and were very pleased with it.

I am looking forward to hearing from other radio enthusiasts via email, etc. and broaden our discussion to include radio signals in your area. 73 and good DX!

Lifeboat/tender used channel 77 for communications



News and Views

Happy New Year to all *Below 500 kHz* readers! A new year is a great time to explore a new part of the radio spectrum. Why not take the plunge into the frequencies below the AM broadcast band? It's hard to find any other 500 kHz slice of spectrum with as much variety as longwave.

From 0 to 500 kHz you will find natural radio, time stations, military communications, experimenters, navigation beacons, broadcasters, and weather stations, just to name a few signals. This month, we have plenty of loggings and news updates to show you just what can be heard on this band.

First up, are you looking for an inexpensive way to get an older shortwave receiver on longwave? Jackson Harbor Press offers a \$12, easy-to-build kit that would make a fun first-time project. You can get full details online at: <http://jackson-harbor.home.att.net/lfconv.htm>. Thanks to Lee Badman, KC2IYK, and Todd Brown, AB2MS for sharing this information.

Lee adds that he discovered the fun of the longwave earlier this year during a business trip to Washington, DC, when he stumbled across beacons DC/332 and GTN/323. Once he realized what they were for, he was addicted! You can check out his full list of loggings at <http://web.syr.edu/~lbadman/ndb.html>. Incidentally, Lee also writes a ham radio column in the *Syracuse Herald*. Keep spreading the word, Lee!

❖ ITU Conference - LF Update

The International Telecommunication Union's 2007 World Radiocommunication Conference (WRC-07) in Geneva concluded in mid-November. Among the many topics related to spectrum management, there was an item of particular interest to LF enthusiasts. An excerpt from *The ARRL Letter*, Vol. 26, No. 45 reported the following:

A secondary allocation of 135.7-137.8 kHz to the Amateur Service was approved on first reading in Plenary on Friday afternoon, November 9. This marks the first time since allocations to radio services began that the Amateur Service has had an allocation below the medium wave broadcasting band. The effective date is not yet set, but is likely to be the date of entry into force of the Final Acts of the Conference. Of course, amateurs must wait until their own administrations authorize the new allocation before they can use it. Some administrations, while not wishing to block the international allocation, have indicated a reluctance to implement it in their countries because of various interference concerns.

Also from *The ARRL Letter*, is this item related to the ongoing experiments being conducted near 500 kHz:

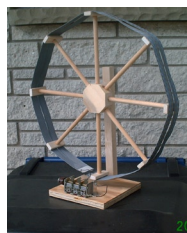
Fall has brought lower static and good propagation, making excellent conditions for the 500 kHz experimenters. The ARRL 500 kHz experimental license, WD2XSH, was issued in September 2006 and has 19 active stations.

Project Coordinator for the ARRL-sponsored 500 kHz experiment Fritz Raab, W1FR, said, "We have been joined by a second US experimental license, WE2XGR, with five participants, as well experimenters in the UK, Germany, Sweden and the Czech Republic; operating modes include CW, QRSS, PSK-31, and others. Contacts have been achieved at distances up to 1234 miles. Signals have been received all over North America, Alaska, and Hawaii, and trans-Atlantic reports are not uncommon.

The best time to listen is between sunset and sunrise, Raab said. "The operating frequencies are: WD2XSH - 505.2-510 kHz; WE2XGR - 505-515 kHz; UK - 501-504 kHz, and SM, DL, OK - 505.0-505.2 kHz. Reception reports should be filed at the www.500kc.com Web site so that they become part of our data base." Additional information can be found at the experiment's Web site and also in the July/August 2007 issue of QEX (www.arrl.org/qex/2007/07/raab.pdf).

❖ Loggings and Letters

Our loggings this month are provided by Robert Kastelic (WI), Lenroy Hogan (NY), and Russ Hill (MI). Robert Kastelic sent along a photo of the loop he built for LW. As built, it tunes from 240 through 470 kHz.



Freq.	ID	Location	By
200	HXF	Hartford, WI	R.K. (WI)
206	QI	Yarmouth, NS	L.H. (NY)
206	RA	Racine, WI	R.K. (WI)
209	DKB	Dekalb, IL	R.K. (WI)
217	CLB	Wilmington, NC	L.H. (NY)
218	YUY	Rouyn, QC	L.H. (NY)
220	BX	Blanc Sablon, QC	L.H. (NY)
236	GY	Gary, IN	R.K. (WI)
239	VO	Val-D'or, QC	L.H. (NY)
242	GM	Milwaukee, WI	R.K. (WI)
243	YVB	Bonaventure, QC	L.H. (NY)
244	DG	Chute Des Passes, QC	L.H. (NY)
248	UL	Montreal, QC	L.H. (NY)
251	JZY	Macomb, IL	R.K. (WI)
254	5B	Summerside, PE	L.H. (NY)
257	YXR	Earlton, ON	L.H. (NY)
260	BL	Milwaukee, WI	R.K. (WI)
263	QY	Sydney, NS	L.H. (NY)

273	ZV	Sept. Iles, QC	L.H. (NY)
275	RF	Rockford, IL	R.K. (WI)
276	YHR	Chevery, QC	L.H. (NY)
278	NM	Matagami, QC	L.H. (NY)
281	DEQ	DeQueen, AR	R.H. (MI)
282	OXD	Oxford, OH	R.H. (MI)
289	YLQ	La Tuque, QC	L.H. (NY)
303	YPP	Parent, QC	L.H. (NY)
323	UWP	Argentia, NF	L.H. (NY)
326	FC	Federicton, NB	L.H. (NY)
329	LLE	West Bend, WI	R.K. (WI)
332	HK	Chicago, IL	R.K. (WI)
332	YFM	La Grande, QC	L.H. (NY)
335	YLD	Chapleau, ON	L.H. (NY)
338	HE	Sheboygan, WI	R.K. (WI)
340	YY	Mont Joli, QC	L.H. (NY)
343	LDM	Ludington, MI	R.K. (WI)
344	BKU	Baker, MT	R.H. (MI)
344	YC	Calgary, AB	R.H. (MI)
350	DF	Deer Lake, NF	L.H. (NY)
350	ME	Chicago, IL	R.K. (WI)
351	YKQ	Fort Rupert, QC	L.H. (NY)
353	LI	Little Rock, AR	R.H. (MI)
353	PG	Portage LaPrairie, MB	R.H. (MI)
354	MKS	Moncks Corner, SC	R.H. (MI)
366	YMW	Maniwaki, QC	L.H. (NY)
373	YXK	Rimouski, QC	R.H. (MI)
377	CWI	Clinton, IA	R.H. (MI)
378	RJ	Roberval, QC	L.H. (NY)
382	LQ	Boston, MA	R.H. (MI)
403	BPO	Oneida, TN	R.H. (MI)
415	CBC	Cayman Brac, CYM	R.H. (MI)
417	IY	Charles City, IA	R.H. (MI)
423	CKP	Cherokee, IA	R.H. (MI)
523	JJH	Johnstown, NY	R.H. (MI)
529	LYQ	Morrison, TN	R.H. (MI)

Doug Gomez (CA) wrote asking about two beacons he is hearing at night. One is PBT/338 kHz and the other is FCH/344 kHz.

Doug, PBT is located in Red Bluff, California, and serves the Benton Field Airport. It is a high power (400-watt) station. FCH is located in Fresno and serves the Fresno Chandler Executive Airport. It is also a 400-watt station.

Joe Majewski wrote with another good question: "Is it possible to couple a long wire antenna to a portable radio to listen below 500 kHz, or will the signals overpower the receiver?"

In my experience, much depends on the portable radio in question and how well its "front end" handles strong signals. Higher-end portables can do quite well on a wire, especially if you are far from any AM broadcasters. I've also seen portables become "swamped" by too much signal and have all sorts of spurious signals appear.

My advice is to try it, but with your attenuator or RF gain turned down. You can gradually increase the gain and see how it reacts to a wire antenna. If a signal completely disappears when you lower the gain, it is a likely sign of overload.

See you next month!

Weiner Clarifies Stance on Pirates

Allan Weiner, the owner and operator of licensed **WBCQ** on 7415 kHz, took to the air during the fall to discuss his many previous on-air remarks about contemporary pirate radio. Some pirate stations believed that he had been attacking them. Weiner himself had a long history of prominent pirate broadcasting two decades ago, and his station advertises itself as a voice of free speech and free radio.

Weiner denies that he is in any sort of feud with any pirate. But, he notes that pirate radio broadcasting is illegal, and that the government can levy heavy fines and seizures of equipment from those who are caught. Thus, he maintains that any station should have a serious purpose if they are going to take a risk of this nature.

Weiner does not endorse the popular use by pirates of single sideband transmitters. He notes that the audio quality of music on sideband radios is sometimes not very good. He also notes that he offers airtime occasionally at a discount rate to pirates. Those who take advantage of this service get much broader signal coverage than is generated by most pirates.

So, rumors about a feud between Weiner and some pirates are false. Nevertheless, some pirate stations have been playing his recorded remarks from the Allan Weiner Worldwide show on **WBCQ** in order to mock them.

Also, *Monitoring Times* magazine apologizes to Weiner for slightly misspelling his name in a previous issue.

❖ New Year a Huge Pirate Holiday

As we note every month, shortwave pirate radio activity always increases significantly around major holidays. Last month we noted that Christmas is by far the biggest holiday of the year for pirate radio purposes. The second most important holidays are normally the New Year holidays. So kick off the DX year with pirates!

❖ Clandestine in English

It is very rare for political clandestine stations to broadcast in English. But, Jeff White at **WRMI** reports that his station is carrying a new anti-Castro quasi-clandestine program that is intentionally produced in English as a voice of Cuban exiles that is beamed to citizens of the United States, not to Cuba.

The producer of this new show is an organization called Centro de Derechos Humanos y Democracia Brigada 2506, or as translated by Radio Netherlands Media Network, "Brigade 2506

of the Center for Human Rights & Democracy." This broadcast uses the normal **WRMI** frequency of 7385 kHz. White says that archived streams of their programs are also available on the **WRMI** web site. Has anybody been hearing this unusual new broadcast?

❖ Indians and Yankees

Although it has nothing to do with unlicensed broadcasting, I need to QSL a few reports that we received this month. Many *MT* readers asked if that was me that they were seeing on the **TBS** network television coverage of the American League Division Series baseball playoff games between the Cleveland Indians and the New York Yankees.

Yes, I was at these games sitting with my friend John Adams, the fan who hits a big bass drum in the bleachers as a cheerleader for the Indians. John is also an amateur radio operator and a DXer. From time to time, the cameras showed a view of John hitting his drum. Next to the drum, that was me, George Zeller, sitting there watching the Indians defeat the Yankees. There apparently was no pirate radio coverage of this event.

❖ What We Are Hearing

Monitoring Times readers heard more than dozen different pirate radio stations this month in an explosion of pirate activity. You can hear them, too, if you use some simple techniques. Pirate radio stations never use regularly announced schedules, but shortwave pirate broadcasting increases noticeably on weekends and major holidays. You sometimes have to tune your dial up and down through the pirate radio band to find the stations, but more than 95% of all North American shortwave pirate broadcasts are heard on 6925 kHz, plus or minus 30 or 40 kHz.

Ann Hoeffter Radio- This one consists of Ann singing over the air. Sometimes she sings cover versions of rock musicians. (None)

Captain Morgan- The Captain still features audio from the Twilight Zone TV show with classic rock music transmitted "from the pirate zone." (None; Free Radio Network web site)

Good Evening Radio- In an unusual format for a pirate, Mr. Good Evening hosts classical piano music on this new one. (None announced)

Happy Halloween- A few pirates use "happy" as an identification around a holiday. This is one of them. (None)

KIPM- Alan Maxwell usually holds forth here with existential dramas. But, there is suspicion that a version heard lately may have actually been a different operation. (Announced maildrops now defunct)

Kracker Radio- Kracker is associated with a variety of pirates, but his most famous current association is as Commander Bunny's running mate for President. (krackerradio@pmlol.com)

KSUR- This station's mission is to preserve surfing music from the 1960s. (KRadioKSUR@yahoo.com)

Laser Hot Hits- A recent North American relay of this active Europirate was by a station that none of our reporters identified. (Merlin)

Liquid Radio- Their musical content has varied from show to show. This month they featured jazz. (None, but has replied via the FRN)

Long Range Radio- Their rock music mixed with comedy material is a common pirate format, but their tunes are sometimes obscure. (None)

MAC Shortwave- Paul Star is the host on this authentic replica of top 40 radio formats of the 1960s. He uses variable frequencies including 3275, 6850, and 6925 kHz. (macshortwave@yahoo.com)

Northwoods Radio- Their "loon call" interval signal "from the Great Lakes" is easy to spot. Dave Zantow notes that they are not always in AM or upper sideband mode. As we see here this month, they sometimes transmit in Slow Scan TV mode. (northwoodsradio@yahoo.com)



Mystery Science Radio- Their broadcasts during the fall featured classical music and a ukulele rendition of Chopsticks. (None known; announced Elkhorn maildrop is closed)

Old Vampire Radio- Halloween caused this veteran seasonal station to emerge once again with discussions of paranormal phenomena. (None known)

Oscar Lima- A new operation, they have been relaying coded one and two digit numbers messages. (None)

Possum Hunting Radio- This apparently new one appeared with a Halloween show that did not appear to be from Brasstown. The announcer warned both the FCC and listeners to ignore his transmission. (None announced)

Radio 6X- Bucky features ancient rock music from the 1950s. (None)

Radio Bingo- This one was a parody of **KSMR**, the militia clandestine from Kentucky. One odd feature is that John T. Arthur wins all of the bingo games. (None announced)

Radio Free Speech- Veteran pirate Bill O. Rights has returned to the air, with rock music and comedy plus Editorial Director Earl Pitts. This station plugs the USA constitution at every opportunity. (Belfast)

Radio Jambu International- This rock and comedy station has announced that it is affiliated with **WBNY** and **Kracker Radio**. (Unknown; try Belfast)

Radio Nonsense- This apparently new one has featured novelty music, classical music, and comedy bits. (radiononsense@yahoo.com)

Radio Paisano- They play Italian music and they sign off with the Italian national anthem. Their Columbus Day broadcast resulted in QSLs. (radiopaisano@gmail.com)

Random Radio- Their format seems to vary on every show, accounting for the station name. Recent shows

Continued on page 61

Back to Basics in '08

Every year I like to list a more or less standard litany of resolutions applicable to ham radio operators (or future ham radio operators) of any stripe:

- (1) If I do not have an Amateur Radio license I will get licensed this year.
- (2) If I do have a license I will upgrade it to the next highest license until I am an Extra class.
- (3) If I am an Extra class I will find somebody who isn't licensed and help them get licensed.
- (4) I will repeat number 3 until the FCC has to increase its budget five-fold to cover the licensing paperwork.

And now... This year's special challenge:

❖ This year I will get back to basics.

Okay, now just what do I mean by getting back to basics? This can mean a lot of different things to a lot of different people. Amateur radio folks are nothing if not an eclectic group with a wide area of radio interests.

For your humble columnist, getting back to basics is not all that far from where I normally play ham radio anyway. I like to think of the adventures the early pioneers of ham radio were having and to see if they can be just as much fun today as in, say, the 1930s. You already know the answer. Of course they were having a great time, and so can you, without spending a wallet full of money to boot.

Early ham hobbyists were more than likely operating CW using fairly simple equipment, often at relatively low power levels. I don't have all that far to fall down this particular well because Old Uncle Skip is a dedicated CW/QRP Op from way back. But a funny thing happened on the way to this column. It turns out our friends at the American Radio Relay League (ARRL) must have been reading my mind. They have come up with an amazing book and kit combination that meets my proposed New Year's resolution to a tee.

ARRL's *Low Power Communication* with 40-meter CW Cub Transceiver Kit Book (3rd Edition) by Rich Arland W3OSS
330 pages
Kit by MFJ Enterprises
\$99.95 plus shipping and handling
The American Radio Relay League
225 Main Street, Newington, CT 06111-1494
www.arrl.org/ 1-888-277-5289
Book ISBN: 1-87259-104-2
ARRL Order No. 1042K

This is an idea I wish I had thought of. I

have long been looking for a quick and easy way to get people started in basic HF ham radio at the \$100 price point. The League goes one better by including the book that is the current standard text for low power radio operation, Rich W3OSS's book on the art and science of QRP.

The third edition of Rich's book builds on previous editions, as well as his earlier QRP books written for Tiare Publications.

Rich begins with a thorough investigation of QRP equipment and suggested station accessories. He follows this with a discussion of the many antenna options available to the low power ham, everything from simple wires to towers and beams.

Perhaps the most important section covers operating strategies. Playing ham radio at low power is best done with a well-developed skill set to allow you to stand your ground against the big guns. Rich covers proven ways to get your signal through the pile ups and even poor propagation.

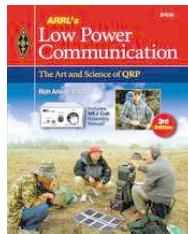
New to this third edition are sections covering Emergency Communication and Military Surplus Equipment. The world of the "New Normal" has most hams thinking about ways to continue to communicate when things get tough. I have even covered EMCOM ideas in this column in the past and, no doubt, will in the future. Rich shows how a well thought-out (and emergency powered) QRP station can be the way to keep in touch when things start to come apart in the world around you, be it by natural or human made disaster.

The chapter on Military Surplus is refreshing in a QRP book. I have operated with this gear as a member of the military and as a ham. The equipment is rugged and usually designed to operate at QRP levels with alternative power systems. If you don't mind a little olive drab in your ham life, this is a fun way to play amateur radio.

The book includes excellent appendices covering suggested QRP operating frequencies and lists of equipment manufacturers that speak fluent QRP.

And as they say: "But Wait... There's More!!!"

The Third Edition of The ARRL's *Low Power Communication* book includes the complete assembly manual for the MFJ Cub Transceiver. Even if you choose to buy the book separately from the kit bundle (sold for \$19.995 separately, ARRL Order # 1042), there is much to be learned from reading the assembly manual for a simple low power rig.



❖ Kitting Around

But we are talking about the book and radio bundle here this month. So let's have a look at what MFJ has put out to help us get back to basics. The old ads used to say: "Read the book... see the movie." Let's call this: "Read the book... Build the kit!"

MFJ Enterprises has a long history of offering well thought out kits for the ham market under their main brand name as well as their Vectronics division. My first 30 meter rig was an MFJ kit. I first saw the Cub kit at the Atlanticon 2000 QRP Forum. It is designed by Fred Littlefield K1BQT. Fred's efforts as a radio designer have earned him a spot in the QRP Hall of Fame. At that time, most of us were just beginning to understand the advantages of surface mount technology (SMT). SMT components allow for a lot of performance at very low cost.



There was only one drawback. SMT stuff is very teeny and requires a deft hand to assemble. My middle aged eyes have been sorely tested trying to get a SMT transistor to sit just right on a PC board more than once. One wrong move with the soldering iron and the part is, quite literally, toast. MFJ saw that they could put a lot of radio into a small and inexpensive package by using SMT, so they came up with a strategy that made the Cub a hit from the day it first hit the market. The SMT parts are premounted and presoldered. All the kit builder is faced with is soldering in a few standard "through hole" parts and you have a high performance, but still pint-sized transceiver to hit the bottom end of 40 meters with Old Uncle Skip.

Thanks to SMT construction of many key parts of the circuit, the Cub's specifications are nothing to sneeze at. The receiver has a sensitivity rating of 0.2 uV with almost no discernable noise from the receiver circuit itself. The Cub uses crystal filtering to make a sharp and CW friendly passband that rejects all but the most intense QRM and QRN. The design uses Differential-Mode AGC and it has enough AF output to easily drive a set of headphones or a small speaker. The RF output is adjustable from 2 watts all the way down to dead

0, making this a perfect rig for taking up the challenge of QRPp "milliwatt" operation.

Keying is electronically switched with full QSK, making it a dream rig for experienced CW ops who like to kick up the speed. But the keying circuit remains friendly to even CW newcomers thanks to its click free keying and natural sounding sidetone. The VFO operating range is about 60 kHz, allowing for a good chunk of the 40 meter CW band. The transmitter offset and receiver passband center are user adjustable. This is a feature usually reserved for much more expensive rigs.

As to power, the Cub likes to see between 12 and 15 volts. It draws a miserly 36 mA on receive and only 380 mA on transmit. You should be able to operate for many hours on a small gel cell, or even give a shot at using it as a solar powered radio.

❖ Assembly

I assembled my Cub kit in one evening. The manual is well written and easy to follow. You have to pay a bit of attention, because the manual is written for building the Cub in one of six band configurations. Since the kit bundled by the League is only for the 40 meter band, I found it easiest to just draw a line through the sections specific to other band configurations. This helped to keep me from getting more confused than I already am.

I have built many such projects, so I discovered no surprises building the Cub. First time kit builders are often challenged by winding the toroidal inductors. Not to worry. There are only two toroids that have to be hand wound. All other inductors are molded or slug-tuned. It is all just a matter of cutting the wire to the right length and remembering how to count as you feed the wire through the center of the toroid. The entire process is clearly spelled out in the manual. Don't be afraid if you are new to radio kit construction.

The manual is written with the first time kit builder in mind. Suggestions are made about your work area, the tools you will need and even the solder and soldering iron that will work best for this project. The directions talk about how to avoid errors and, if you do happen to make a mistake, the proper way to desolder a part without causing any harm to the circuit. The manual includes a parts inventory and checklist to make sure you clearly identify each component before you add it to the circuit board and commit yourself to soldering it in place.

The Cub is a great place to start building your own gear, but fair warning, radio project building – be it kits or prototype designs – is a highly addictive form of radio fun. If you choose to sacrifice a few hours on the air to hit your basement workshop and melt some solder, we will all understand. It happens to the best of us.

❖ On the Air

Once I had the Cub assembled, I ran a few voltage checks to make sure everything was in order. The pinout IC voltages are published in the manual in the troubleshooting section if you are curious. Happy with what I saw, I brought the Cub up out of the basement and attached it to my 40 meter dipole. I took an old "Navy" key down from my collection. I plugged in my solar charged battery pack and began listening around my usual QRP haunts as well as down into the Extra portion

of the band. As mentioned earlier, the receiver is very quiet. Admittedly, I had to fight the bottom of the Solar Cycle to work any contacts, but the reports I got back indicated the signal from the Cub was of high quality and good tone. A QRP CW op can't ask for much more.

This time of year always brings a number of fun QRP contests as well as the regular low power operating activities such as the Adventure Radio Society's monthly "Spartan Sprints." I expect I will keep the Cub up and running through a good part of the winter here in my shack. After that, I think it may be put in the front hatch on my kayak for some fun on spring and summer river camping trips. I can fit the Cub, battery pack and wire antenna all into a standard 1 gallon zip lock bag. Perfect for fun forays into the wilds.

So I am now more "back to basics" than ever before, hammering along with a straight key, running 2 watts into a wire. Ham radio just doesn't get any better than this! Make the commitment to get back to the basics of amateur radio and meet me down on the bottom end of 40 meters. Have fun!

Outer Limits continued from Page 59

featured pop music from the 1930s. (None; asks for reports via the FRN web site)

Special Ed- So far this newcomer operated by Special Ed has mixed rock music with country instrumentals. He plays various versions of "Stairway to Heaven." (None)

Sycko Radio- Occasionally identifying itself as **WSKO**, the Psycho pirate specializes in rock music and comedy format. (syckoradio@yahoo.com)

The Crystal Ship- The Poet is still the "Voice of the Blue States Republic." His political commentary from the left is supplemented with rock and folk music. Frequencies usually vary here, including 1710, 3346, 3275, 5386, 6875, 6925, 7576, and 9057 kHz. (Belfast and tcshortwave@yahoo.com)

Theramin Radio- They are a new operation, but some DXers think that they might be related somehow to **KIPM**. They have been heard with relays of programs from other pirates. (None known)

Undercover Radio- Dr. Benway's veteran pirate broadcasts "from the middle of nowhere," with rock music and adventure stories. (Merlin and undercoverradio@mail.com)

Voice of Hell- This new station claims to be the official voice of Satan, but Satan apparently has no means to accept mail down in Hell. He plays heavy metal rock music. (None)

Voice of Pancho Villa- This station is normally associated only with the Kulpville, PA, Winter Shortwave Listeners Festival. But, some pirate has been relaying old shows from Pancho. (Blue Ridge Summit)

WAHR- Apparently a new station this year, their call letters stand for "Automated Halloween Radio." Male and female computer voices hosted their show. (None announced)

WBNY- Commander Bunny's clandestine parody with his active campaign for President of the United States puts him in a league with Steven Colbert. He sells campaign t-shirts on e-bay for the Bunny-Kracker Presidential ticket. (Belfast and rodentrevolutionhq@yahoo.com)

WBST- Although there is some question about the call letters that they used this year, this veteran Halloween station returned to the air. (Former Washington address defunct)

WHYP- James Brownyard returned to the air with at least one late 2007 broadcast from North East, PA. (Belfast and whypradio@gmail.com)

WMR- This new one uses a slogan of "We Monkeys Radio," so there is a suspicion that it might have been associated with **WBNY**. They play only short segments of rock songs so that monkeys can understand the shows. (None announced, try Belfast)

Wolverine Radio- They feature the classic pirate radio formula of rock music and comedy, sometimes with David Letterman-style top ten lists. (None announced)

WFUQ- There are plenty of obscenities on this new pirate. (None)

WTCR- The station plays classic rock music with a slogan of "Twentieth Century Radio." (Belfast)

UNCLE SKIP'S CONTEST CALENDAR

ARRL Straight Key Night
Jan 1 0000 UTC - 2400 UTC

ARS Spartan Sprint
Jan 7 0200 UTC - 0400 UTC

ARRL RTTY Roundup
Jan 5 1800 UTC - Jan 6 2400 UTC

North American QSO Party (CW)
Jan 12 1800 UTC - Jan 13 0600 UTC

Hunting Lions in the Air
Jan 12 0000 UTC - Jan 13 2400 UTC

MI QRP January Contest (CW)
Jan 12 1200 UTC - Jan 13 2359 UTC

North American QSO Party (SSB)
Jan 19 1800 UTC - Jan 20 0600 UTC

CQ 160-Meter Contest (CW)
Jan 26 2200 UTC - Jan 27 1600 UTC

ARRL January VHF Sweepstakes
Jan 26 1900 UTC - Jan 28 0400 UTC

WTPR- This station is different from the previous one, despite the similar call letters. They use a "Tire Pressure Radio" slogan, warning listeners that the air will shortly disappear from their tires. They also relayed Allan Weiner's **WBCQ** remarks that we discuss above. (None)

WTF- This new rock music and novelty music station extracts its slogan from an obscene expression. (None announced)

❖ QSLing Pirates

Reception reports to pirate stations require three first class stamps for USA maildrops or \$2 US to foreign locations. The cash defrays postage for mail forwarding and a souvenir QSL to your mailbox. Letters go to these addresses, identified above in parentheses: PO Box 1, Belfast, NY 14895; PO Box 109, Blue Ridge Summit, PA 17214; PO Box 146, Stoneham, MA 02180; Casilla 159, Santiago 14, Chile; and PO Box 293, Merlin, Ontario N0P 1W0. Unfortunately, PO Box 69, Elkhorn, NE 68022 is no longer a valid address, although a few pirates announce it, and some claim to still be getting replies through it.

Some pirates prefer e-mail, bulletin logs or internet web site reports instead of snail mail correspondence. The best bulletin for submitting pirate loggings with a hope that pirates might QSL is now the e-mailed Free Radio Weekly newsletter, still free to contributors via freeradioweekly@gmail.com. A few pirates will sometimes QSL reports left on the outstanding Free Radio Network web site, at www.frn.net on the internet. The ACE, a formerly widely read print bulletin, can no longer be used in order to notify pirates that a listener heard a broadcast, but it does have a loggings section and an archive of *Free Radio Weekly* issues on its web site at the www.theaceonline.com/ URL.

❖ Thanks

Your loggings and news about unlicensed broadcasting stations are always welcome via 7540 Highway 64 W, Brasstown, NC 28902, or via the e-mail address atop the column. We thank this month's valuable contributors: John Adams, Brecksville, OH; Brian Alexander, Mechanicsburg, PA; Kirk Baxter, North Canton, OH; Jerry Berg, Lexington, MA; Artie Bigley, Columbus, OH; Bob Brown, Lansdale, PA; Jerry Coatsworth, Marlin, Ontario; Richard Cuff, Allentown, PA; Rich D'Angelo, Wyomissing, PA; Gerry Dexter, Lake Geneva, WI; Bill Finn, Philadelphia, PA; Harold Frodge, Midland, MI; William T. Hassig, Mt. Prospect, IL; Vince Havrilko, Mountain Home, ID; Harry Helms, Smithville, TX; Ed Insinger, Summit, NJ; Ed Kusalik, Coaldale, Alberta; Chris Lobdell, Tewksbury, MA; Greg Majewski, Oakdale, CT; Joe Miller, Troy, MI; Mark Morgan, Cincinnati, OH; *Curt Phillips, Raleigh, NC*; John Poet, Belfast, NY; Robert Ross, London, Ontario; Martin Schoech, Eisenach, Germany; Bob Wilkner, Pompano Beach, FL; Mike Wolfson, Springfield, OR; Joe Wood, Greenbriar, TN; and Dave Zantow, Janesville, WI.

Antenna Polarization and Communication

Antenna polarization can be a determining factor in how well our attempts at receiving radio signals succeed. Let's take a look at why this is true.

❖ Linear Polarization

When radio-frequency current flows in an antenna, the antenna radiates radio waves. If we set up a half-wavelength dipole horizontally, then the electric field produced by current in that antenna will be oriented horizontally, too (fig. 1A). If we take that same antenna and mount it vertically by hanging one end from a high point, then its electric field will be oriented vertically (fig. 1B).

In fact, generally speaking, we can tell the polarity of an antenna with straight (linear) elements, and the polarity of the waves it radiates, by noting the orientation of the antenna with respect to vertical or horizontal, or some angle in between those limits. That is, (still generally speaking), antennas with horizontal elements are horizontally polarized and radiate horizontally-polarized waves; antennas with vertically-oriented elements are vertically polarized, and so forth.

So, why should we as radio hobbyists be interested in polarity? The main reason is that polarity can sometimes mean the difference between very clearly receiving the signal you want to hear, or that signal being so weak that it is impossible to understand or to decode. This is because the signals which you receive on your antenna all have some kind of polarization, and if the polarization of the incoming wave is too different from the receiving antenna's polarization, then very little of the energy of that incoming signal will energize

your antenna.

For example, if the polarization of the incoming wave is vertical and your antenna's polarization is horizontal, then we say that the antenna and wave are "cross polarized," and very little signal strength will reach your receiver. However, if the polarization of antenna and wave are identical, then maximum transfer of energy from the wave to the antenna will occur, and maximum signal strength is fed to your receiver.

Note that, although I use only "horizontal" and "vertical" polarizations in the example, linear polarization can be at any angle from 0 to 90 degrees (horizontal to vertical).

Examples of linearly-polarized antennas include single dipoles, groundplane antennas, grounded quarter-wavelength antennas, and Yagi-Uda beams.

❖ Elliptical Polarization

As you know, many antennas are not just straight wires. Some are bent, circular, square, spiral, or other shapes. Some of these non-linear shapes produce linear polarization, and a few designs produce what is called "elliptical polarization." One kind of elliptical polarization is called "circular polarization." To make life a bit more interesting, some elliptical and circular polarization is "right handed," and some is "left handed."

Again, "Why do we care?" Well, if we try to receive right-handed signals with an antenna that is left-handed, we won't get much signal. Handedness must match for maximum signal transfer. On the other hand, circularly polarized

antennas respond relatively well to linearly polarized signals of any angle of polarization: the loss is only 3-dB. Thus, when signals with varying polarization are to be received, a circularly-polarized antenna is a good choice. For example, signals which communicate with space vehicles or satellites must pass through our atmosphere, where they undergo varying degrees of rotation of their polarization. Circularly-polarized antennas are useful for reception of such signals.

Examples of circularly-polarized antennas include the crossed-dipole or turnstile (fig. 1C), and axial-mode helix (fig. 1D) designs.

❖ Some Practical Implications: Middle Medium-Frequencies and Below:

Although antennas for the lower frequencies (longer wavelengths) are often quite tall, they are still very short if measured in wavelengths. Getting horizontal antennas high enough to produce useful horizontally-polarized waves at these very long wavelengths is totally impractical. So, practical transmitting antennas for the lower end of the radio-frequency spectrum are almost always vertically polarized. Vertically-polarized waves from these antennas "drag their feet" in the earth, and slowly, but progressively become slanted towards horizontal as they travel.

Medium-Frequency to the High-Frequency Band:

As we move higher in frequency, roughly from the upper portions of the medium-frequency band to the top of the high-frequency band, then sky waves become a major basis for communication. And, as sky waves interact with the ionosphere they often change polarization along the way. However, if antenna and signal are not too close to being cross-polarized, worthwhile signal strength can be captured.

On the HF band, wavelengths are shorter than on the lower frequencies, and so it is practical to produce either horizontal or vertical polarization on the top half of the band. For transmitting or receiving, the use of vertically-polarized antennas favors low-angle, vertically polarized waves. This kind of signal skips farther than high angle radiation. And, regardless of what antenna transmitted them, long-haul (DX) signals arriving at a receiving antenna are likely to be at low vertical angles. So you can see why the grounded, quarterwave, vertical is popular with DX operators.

Horizontally-polarized antennas, such as a halfwave dipole mounted horizontally, have radiation-reception patterns pointing mainly upwards if they are mounted about a quarter wavelength or

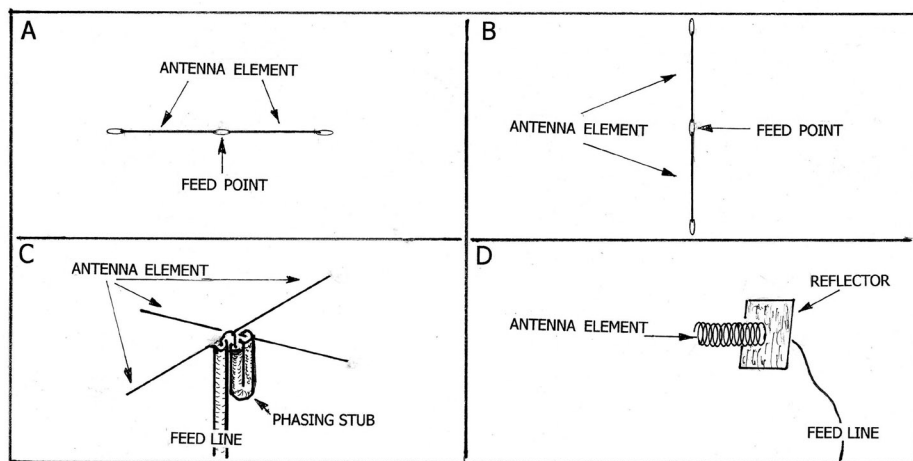


Fig. 1. A horizontally-polarized dipole antenna (A), a vertically-polarized dipole antenna (B), a circularly-polarized, turnstile antenna (C), and a circularly-polarized, axial-mode, helical antenna (D).

This Month's Interesting Antenna-Related Web site:

A chart of polarization-match losses and more:

www.tscm.com/polariza.pdf

More antenna-information links than you want at:

www.educyclopedia.be/electronics/antennas.htm

less above ground. This leads to something called "near-vertical incidence skywaves" (NVIS). NVIS supports close-in communications well, but is ineffective for DX.

If antennas are mounted about a half wavelength above earth, they produce low-angle radiation that supports DX well. This is often practical at in the higher portions of the HF band, but down at 3.5 MHz a half wavelength in air is about 140 feet. Not many of us can mount our antennas that high!

At VHF and Higher in Frequency:

Much of the communication at VHF and higher in frequency is by what is called "line of sight" and has a maximum distance somewhat greater than our visual line of sight. With this kind of signal, propagation waves go directly from the transmitting antenna to the receiving antenna, and the signal's polarity is reasonably preserved. So, matching the polarity of transmitting antenna and receiving antenna can maximize signal strength. If you have a linearly-polarized antenna on VHF or UHF that seems unresponsive, you might try rotating it to see if a change of polarization will help.

RADIO RIDDLES

Last Month:

I asked: "Antenna reciprocity was mentioned above. What is it?"

Well, antenna reciprocity means that whether receiving or transmitting signals, the characteristics of an antenna remain the same: same radiation (reception) pattern, same gain,

same feed-point impedance, and so forth. Makes life simpler, doesn't it?

This Month:

"Why is a lightning bolt like an antenna? Or maybe a lightning bolt is an antenna?" Is it?

You'll find an answer to this month's riddle, another riddle, another antenna-related web site or so, and much more, in next month's issue of *Monitoring Times*. 'Til then, Peace, DX, and 73.

At these frequencies, much of the communication is to and from motor vehicles. The most convenient antenna for a vehicle is usually a vertical whip or roof-mounted groundplane antenna. And frequent changes of vehicle position make the non-directional radiation-reception pattern of these antennas useful. So, vertical polarization dominates mobile work at these frequencies. On the other hand, electrical noise is typically vertically polarized at these frequencies, so communication not involved with mobile units often utilizes horizontal polarization to reduce interference.

For systems where fading is unacceptable, polarization diversity (use of two or more antennas with different polarities) is common at these frequencies. For example, polarization diversity is often used for wireless microphones because musicians and speakers move the microphone as they perform. These movements cause signal polarity to change.

❖ In Sum

We can't see radio waves, so we can't look at our antennas to see what is happening to the waves. Nevertheless, some interesting things go on as waves travel away from the antenna or arrive at the receiving antenna. From this short discussion we can see that antenna polarization and wave polarization are important considerations in many antenna applications.

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The BC-348 Begins to Talk

Last month, we finished installing a permanent power supply in the BC-348's vacant dynamotor well. No more clip lead lashups! With everything self-contained, we're free to move the radio from one position to another as the diagnostic testing might require. So after all these months, we're finally at the place where many restorations begin. We can undertake the interesting process of troubleshooting.

Not that I look at all of the previous work as unrewarding. It was fun to see the front panel come to life after its cosmetic treatment and very satisfying to replace the myriad of leaky paper capacitors with reliable modern ones.

It was also quite interesting to follow, and clean up, the work of the previous owner – who had done a rational, if somewhat messy, job of applying power to the radio. He had apparently connected some sort of outboard supply, but seems to have done no other conversion work. Finally, I enjoyed putting together and connecting the little dynamotor-well power supply.

❖ First: A Fuse and a Speaker

Before beginning troubleshooting in earnest, I added an extra safety feature – a 250 mA fuse in series with the B plus lead. In the event of any trouble in the high voltage circuits, this fuse would blow much faster than the one I had installed in series with the a.c. line. I created a convenient spot for it by removing a board holding a now unused r.f. choke (labeled “100” on the schematics) that had been part of the low-voltage power input filter system.

I was concerned enough to add the fuse



Speaker and output transformer in small tabletop baffle – all scrounged from junkbox. The baffle will get a coat of black paint to match the radio.

because of a group of original metal-cased paper capacitors that I had not changed out. They had tested well for leakage and capacity, but are rated at only 250 volts. The B plus voltage, however, peaks at some 300 volts – not dropping to about 220 until the tube heaters warm up and the tubes begin drawing current from the supply.

I was pretty sure that these sealed metal-cased capacitors could handle the temporary voltage peak, but a short in one of them could ruin a difficult-to-replace part elsewhere in the circuit. So I decided to take no chances. All of the other paper capacitors in the set had been replaced with 630-volt units.

When turned on for testing, the set behaved just as it had since I first applied power to it. That is, it was silent except for random static and the earsplitting disturbances produced when the “avc-off-mvc” switch was moved or when the volume control (still noisy in spite of its previous chemical treatment) was rotated through certain spots. Nothing from the front end of the radio was getting through, as evidenced by the fact that moving the band-switch or screwdriver-scratching the antenna post or the grid caps of the r.f. tubes produced no sound at all.

Up to now, I had done all testing using earphones. But I was tired of hearing the loud static close-up and decided to put together a little speaker system for the set. As it happens, the audio output transformer of the BC-348 will not match a standard 8-ohm speaker. It can be set for an impedance of 300 ohms (to match either a low-impedance headset or the aircraft's intercom line) or 4000 ohms (to match a high-impedance headset).

Some of the old-time hams who originally converted these sets for their use tore out the original output transformer and substituted one that would match the 6K6 audio output tube to an 8-ohm speaker. Some, who felt that the audio output was too weak, even added a first audio stage ahead of the 6K6. Others took the much easier route that I followed.

The 4,000-ohm output of the BC-348 will work very well into the primary of an output transformer taken from almost any small tube-type table radio of the 1950s, 1950s, or later. The secondary of such a transformer is, of course, designed to feed an 8-ohm speaker. The output transformer and speaker could be connected to the BC-348 through one of its phone jacks with no wiring changes required.

I raided my junkbox looking for a set that I could cannibalize and – being a lazy cuss

– was hoping I might find one with the output transformer already mounted on, and connected to, the speaker. I did find a set with such a speaker, but I couldn't use it because it was an older dynamic version, requiring a source of d.c. to energize its magnet.

A little later, I located a small tabletop speaker cabinet with a 6” PM (permanent magnet) speaker already mounted in it. To this, I connected the secondary of a likely looking output transformer from the junk box and wired a length of zip cord, terminated in a phone plug, to the primary. I secured the salvaged transformer to the inside of the cabinet base with a dab of “Goop” auto cement, added a staple to keep the zip cord from pulling out of the transformer, and I was in business. So far, the volume available from this arrangement seems more than adequate.

❖ Located: A Dead I.F. Stage

Now on to the troubleshooting! I began by feeding an audio tone from my signal generator into the grid of the audio output tube and was rewarded by hearing it emerge from the speaker. Backing up a couple of stages, I set the generator for a modulated signal at 915 kHz (the intermediate frequency) and applied it through a small capacitor to the grid cap of the third i.f. tube. Again I heard the tone from the speaker – but louder. So far, so good.

Backing up another stage, I injected my test signal into the grid of the second i.f. tube. The tone in the speaker was still louder, suggesting that this stage was amplifying properly. When I backed up to the first i.f. tube, I expected the signal to be still louder – reflecting the gain of this extra stage. However, the volume dropped off to a negligible amount. Apparently I had uncovered a problem.

Now I began a voltage check on each of the elements of this tube, intending to compare the values with those given in the maintenance

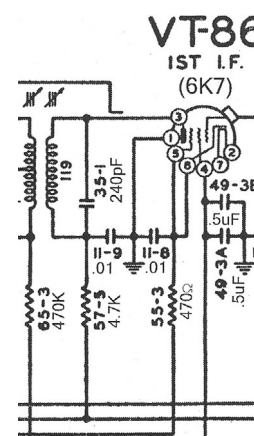


Fig. 1. Schematic of first i.f. stage showing the trouble spots (see text).

manual. But in the process, I found that there was no voltage at all on the plate.

I've shown a schematic of this stage as Figure 1. Voltage is fed to the 6K7 plate (pin 3 of the tube) from the B plus bus through 4.7 k resistor 57-5 and the primary of i.f. transformer 11-9. The most obvious reason for no voltage at pin 3 would be an open i.f. transformer winding.

This was a horrible thought. It's doubtful that the fault could be repaired, and one obviously can't run down to Radio Shack and purchase a BC-348 first i.f. transformer! Also, of all the i.f. transformers in the set, this would be the most difficult to change. Its base wiring and mounting nuts are buried beneath other components – notably the large “avc-off-mvc” rotary switch with its multiple cabled wiring connections.

Not only that, but the feedback loop that makes the c.w. oscillator oscillate (one end is shown as the unconnected wire above the lead to pin 3) is located right over the base of the transformer and is tied in place at a couple of locations because its positioning is critical. This is not something one would want to disturb.

❖ The Reason: An Open Resistor

The only other possibility for the fault would be if resistor 57-5 were to be open. That seemed unlikely because, while carbon resistors are known to change in value over time, they are rarely found to be completely open. However, 57-5 *was* open. There was voltage on the B plus side of the resistor but not on the tube side.

The resistor looked intact, but was half hidden beneath one of my replacement capacitors. Probing around under the capacitor, I felt the resistor come apart, and when I extracted the two halves, I saw that they appeared to be burned. Reflecting a moment, I thought I knew why.

Readers who have been following the column awhile may remember that, during my wholesale capacitor replacement, I found that one – and only one – had already been replaced. This was capacitor 11-9 which, if shorted (see in figure 1), would place resistor 57-5 directly across the B plus and certainly burn it out. However, as it would turn out, that replacement had been in vain.



The two ends of the burned resistor after I fished them out from behind one of my replacement capacitors.

Of course a shorted capacitor would now be unlikely since I had recapped the set and even replaced the previous replacement. Satisfied that I had

unearthed the problem, I installed a new resistor. As luck would have it, I didn't have a 4.7k resistor in the appropriate 1/2-watt size and installed a 5-watt one instead.

An ohmmeter check showed that the new resistor was not shorted to ground and, in fact, that there was continuity between the resistor and pin 3 of the 6K7. So it looked like the primary winding of the i.f. transformer was ok. I turned the set on, leaving the voltmeter connected between ground and pin 3. The voltmeter kicked up for a moment and then fell back to zero. At the same time, I felt the new resistor heating up like a small radiator.

Immediately shutting off the power, I repeated the ohmmeter check and found a low-resistance ground on the tube side of the resistor. This was the beginning of one of the oddest trouble-shooting sessions I've ever had. The only thing I could think of was that my brand-new replacement cap for 11-9 had somehow gone bad. I disconnected and checked it. It tested fine but, somehow, the short had disappeared.

Just to be safe, I installed a new cap and applied power again. But once again the short was back; the resistor was heating up and there was no voltage on pin 3. I was dealing with a very odd condition – quite possibly an intermittent short within the first i.f. transformer can.

❖ The Elusive Short Identified

Quite bummed out now, I reluctantly began to explore the possibility of removing the i.f. can for inspection. I dismantled the “avc-off-mvc” switch to see if I could move it out of the way for better access to the base of the can. But I found that I would also have to dismount the volume control and move it aside to give me access to disconnect a short lead that was holding the switch assembly back.



The base of the problem i.f. transformer (long screw protruding from center) can be seen between my large 5-watt replacement resistor and the back wafer of the “avc-off-mvc” switch.

Now I could peer down at the base of the i.f. transformer, where the three connection terminals could be seen – partly obscured by the c.w. oscillator wiring. On the off chance that perhaps a stray strand of wire could be causing the intermittent ground, I began to probe around each terminal with a fine screwdriver.

The ohmmeter was still connected, and I found I could make the short momentarily disappear by pushing against one of the terminals.

There was no sign of anything near that terminal that could cause a short, and I once again began to think that the problem must be inside the can. But then I finally spotted the trouble. It was a little blob of solder with some embedded wire that had fallen into the space between another of the terminals and the chassis. I fished it out with some forceps and the short disappeared completely and permanently!

Apparently the blob had been just close enough to the terminal and the chassis to make the intermittent ground. And even though I had been pushing against one of the other terminals, I had been moving the whole assembly enough to trigger the condition.

Reconnecting and remounting the switch and volume control, I applied power again. Now I could hear static when moving the bandswitch – a very good sign. Scratching on the antenna post with a screwdriver, I not only heard the hoped-for static, but also the distorted murmur of voices. The front end and the i.f. channel were in communication once more.

The voices were intermittent and appeared at the same place on the dial at a couple of different positions of the bandswitch. No other signals could be heard, even with a long piece of wire connected to the antenna post. So our BC-348 has still more secrets to give up before it becomes operational. More next time!

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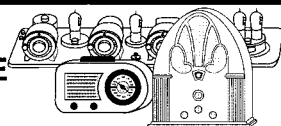
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HD Radio Round-up

By Ken Reitz KS4ZR

Throughout 2007 *MT* has taken a look at as many HD Radio sets as we could coax out of manufacturers. This article looks at the complete list, fills in some of the gaps, and updates any changes that have occurred in the meantime. In addition, other moves in the HD Radio industry are explained and I'll look at the available reception aids listeners will need to ensure adequate reception.

❖ It's 2008, Do You Know Where Your HD Radio Is?

The most extraordinary thing about HD Radio is that, despite the millions of dollars poured into promotion, it's still the most unknown "latest thing" in home electronics. It's not like the products are hard to find. They've been in Walmart for almost a year! Still, most people I ask have never heard of it and, when I explain what it is, I get the same dull look I get when I tell people I have a shortwave receiver in my car. To most people it's incomprehensible. A radio trade journal had this headline: "HD Radio Ready for Prime Time." The date? February, 2004.

There have been many problems in the process of HD Radio getting a foothold in the market. First, was the delay in getting the first generation radios back from China. The months dragged on. The second was sending them back to China to work out the bugs. The months dragged on. Every manufacturer ran into the same problem; none were immune.

The third problem was getting radio stations to shell out the quarter million dollars for the up-grade to install the HD transmitter and antenna. That remains one of the biggest obstacles and will continue so for some time. Very few non-commercial radio stations have that kind of money. Most commercial radio stations are having a tough time returning a profit to their stockholders without piling on the up-front costs of switching to HD Radio.

The biggest problem in doing the switch may be in-house competition for other, more immediate expenditures. More stations are pouring money into translator and repeater transmitters to broaden their signal coverage. That's a much cheaper proposition and returns quick money for commercial and non-commercial broadcasters alike. More stations are also putting more money into on-line broadcasting. The burgeoning market in high-speed Internet access has brought millions of potential listeners to a

station's signal on the web. The introduction of new web-based table radios may actually catch on faster than HD Radio. *[MT hopes to cover these new "receivers," too, in upcoming issues - ed.]*

There's a psychological component as well. Consumers are finally waking up to the fact that they are going to have to buy set-top digital TV tuners if they don't want to buy a brand new TV set in order to continue watching "Dancing with the Stars." There's been a lot of grumbling. The very last thing they want to hear is that some time in the future they'll have to do the same thing for their radios. Consumers see no compelling reason to hop on board the HD Radio train, currently side-tracked at the depot while no one can find the engineer.

Finally, there's consumer techno-fatigue, which is what happens when consumers are bombarded with new whiz-bang electronic gadgets year-round. Since HD Radio was introduced, America has been swept by personal GPS craziness, iPod hysteria, the BlackBerry and Blue Tooth bonanza, Xbox and PlayStation mania, the iPhone, the GPhone, continual upgrades in satellite radio and plain old cell phones that send text messages, take pictures, surf the web, oh yeah, allow phone calls. It's no wonder HD Radio got buried.

❖ HD Radio Innovations

Despite the difficulties in attracting the public, manufacturers have persisted in making quality products with real innovations. The biggest innovation in HD Radio is in the listening. Hearing HD Radio on a primary HD channel is quite spectacular. The clarity of the music is unmatched against any analog or digital source, including satellite radio and especially against Internet radio. The only thing that comes close to the sound is the original compact disc.

The second innovation is the concept of multi-casting: broadcasting second and third audio channels on the same frequency as the main signal. Here, listeners are treated to a wide variety of format ideas. While most station simply broadcast an automated play-list, other stations, such as HD Radio pioneer WAMU-FM, a public radio station in Washington, D.C., are transmitting completely different formats and experimenting with the possibilities of the technology. I've heard reports from HD Radio listeners in other major cities who are listening to literally dozens of different formats that didn't

exist in their city two years ago.

Non-commercial stations benefit the most from broadcasting in HD. Instead of competing with their main channel, they're enhancing their entire station by adding other formats, encouraging new listeners to tune in and, when pledge time rolls around, there's much more of a reason to donate. Commercial stations are prohibited by the FCC, during the "hybrid" period of the HD experiment, from having advertising on their second or third channels. There's little incentive for commercial stations to broadcast channels that will compete with their main channel which is commercial supported.

On the manufacturing side, despite the fact that, to this date, not a single manufacturer has made a portable HD Radio, the radios that are available are loaded with innovations. At first, manufacturers were more concerned with having a competitively low price and offered few innovations on their early units. Since then, the market seems to be splitting between two tiers: entry level (no-frills) and music-lover (radio enthusiast).

At the low end are the Radiosophy HD100 and Radio Shack's Accurian HD. At the high end are Polk Audio's iSonic and Sangean's HDT-1X. In between are Boston Acoustics Receptor HD, Cambridge SoundWorks 820HD, and Sony's XDR-S3HD.

Two and a half years ago, one of the first sets to make a splash was Radiosophy's Multi-Stream, which actually won a design award at the 2005 Consumer Electronics Show. But, production glitches and pricing issues forced the product completely off the market. Since then, Radiosophy recovered its balance with the HD 100, the cheapest of all HD Radio sets on the market.

Sangean's HDT-1 saw an up-grade during 2007, becoming the HDT-1X and rising to the top of the chart in performance and features. They've added the fiber optic output I asked for in my July 2007 review; they've made the display completely disappear when the set is off; they've made direct frequency access with the remote and on the front panel much easier; and they've added a signal strength indicator. Best of all, the HDT-1X remains the most sensitive of the HD crop with almost "brick wall" frequency separation.

Polk Audio's iSonic has added a separate model with a built-in iPod docking station which can be controlled by the iSonic's remote. The new iSonic ES2 also features iPod "tagging,"

a commercial boon to Apple's iTunes web site. The iSonic has the best audio of any of the stand-alone desk-top HD Radio sets.

❖ Tuning HD Signals in the Real World

Given all the innovations in sound and features, receiving HD Radio signals is mostly dependent on one thing: how close you are to the transmitter. If you're familiar with tuning digital TV signals, you already know the biggest problem with HD Radio. You either get perfect reception or you get no reception. Unlike listening to analog FM, there's nothing in between. The closer you are to the station you want to listen to, the more you'll like HD Radio. The days of listening to FM signals from distant cities are a thing of the past unless you're willing to make a substantial investment in an FM antenna system.

Unfortunately, all of the middle tier table-top sets made today appear to use nearly identical HD receivers and, as a result, reception capabilities are pretty much the same. Every set sold comes with a T-shaped folded dipole for FM listening, but, unless you live in a suburban or urban location, that will be nearly worthless. Some sort of external FM antenna is required if you hope to get the same kind of reception in HD that you've been used to in the analog world.

The cheapest solution is a six element FM Yagi antenna which costs about \$22 from Solid Signal (www.solidsignal.com). This antenna on a short mast in your attic, pointed in the direction of the stations you want to hear and attached to a run of RG6 coax cable, should bring you back to your former analog reception capabilities. If necessary, add a mast-mounted pre-amplifier to boost the signals. It will make all the difference, especially tuning HD Radio signals.

If you want to listen to distant stations from different directions, add a rotator to the set-up. If the signals are still not quite making the radio lock on to the digital signal, then you'll have to go to a bigger antenna. You can see that eventually this will lead into serious money. But, it's what you'll have to do if you want to enjoy the full world of HD Radio.

❖ The Desert of Mobile HD Radio

When satellite radio first started, they put huge amounts of effort courting the world's automobile makers to make satellite radio available as an option. It took years for this to finally pay off. Unfortunately, makers were forced to decide with which satellite radio service to sign. Now, with the possibility of a merger, those who bought cars with built-in satellite radio capability may still end up having to buy add-on units to adapt to the new scheme.

I believe this recent history has kept car makers from rushing to sign up with HD Radio. Already wondering what to do with satellite radio, they are reluctant to add to their woes by offering HD Radio reception. The result is that very few automobiles are available with HD Radio and it's probably just as well. Unless your commute takes you from suburbs to city,

you'll find little reason to want HD reception in your car. The little 29" whip antennas on cars aren't capable of bringing in HD signals from any distance.

A few manufacturers are trying the add-on approach, offering HD tuners which will work with your existing car radio. But, unless you have a car radio that actually has HD reception capability, you'll not hear the great audio. You will be able to tune the multi-cast channels, but the audio will be standard FM stereo.

One of the places that HD could shine in the car is on the AM band. AM HD Radio sounds great. It sounds like analog FM but not like CD. Still, the big problem here is programming. Most AM stations run non-stop talk shows. The only time you'll really enjoy AM HD is when there's music on during a commercial. Who cares?!

❖ HD Radio's Future

There's no doubt that eventually all analog FM signals will be turned off and we'll have a totally digital FM world. But, that date is so far away that no one in the industry even wants to speculate. Last year the best estimate I could get from anyone who knew anything in the industry was ten years.

Meanwhile, there is an inexorable march to the all-HD Radio world. Radio stations, both AM and FM, continue to replace their analog transmitters with new HD hybrid transmitters; programmers are developing more program sources for both commercial and non-commercial stations and manufacturers continue to add to their existing inventory and introduce new HD Radio models.

A number of big radio manufacturers are notably absent from the HD Radio market. Bose has been very quiet about its HD plans. Perhaps they're working on a special HD model or perhaps they're planning to upgrade their current Wave radio models to tune HD. I look for them to make some announcement just prior to the next CES show this spring.

Crosley Radio is another that has purposely stayed away from the HD fray. As stated in an interview with Crosely president Bo LeMastus in last month's *MT*, they're waiting to see how things develop in the industry before making a move. Finally, I look for major stereo producers such as Kenwood to introduce new products with built-in HD reception capabilities this year.

Listening to HD Radio (depending on where you live and what you can hear) is well worth the investment in a new radio. Luckily, that doesn't have to be too expensive. Even with the cheapest set you can take the output and put it into your stereo. You may not be getting the full HD sound, but you'll at least be able to listen to the multi-cast channels in your area. To find out which stations are broadcasting in HD in your area, go to www.hdradio.com and click on "find a station." The chart is kept up to date and includes all the stations in your state that are broadcasting in HD and are multi-casting. This will give you an idea of what you may (or may not) be missing.

See HD Radio Comparison Chart on next page.

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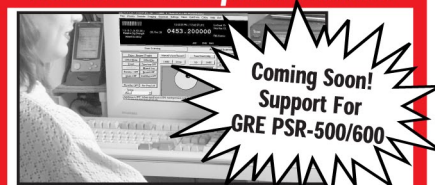
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A COMPARISON OF HD RADIOS

HD Radio sets by category in order of merit. There's no competition for the Sangean, as it's the only component model available. And, there's no competition for the Polk iSonic, because it's the most expensive thing out there and it does it all.



COMPONENT HD RADIO

Sangean HDT-1X \$249 MSRP (Manufacturer's Suggested Retail Price)

Best of all HD sets in performance and features, but it's a component only. No speakers, no built-in amplifier, no CD/DVD player, no satellite radio. It's only as good as your stereo, but, on a good stereo it's great. Full review in July 2007 *MT*. Available from Crutchfield catalog store 888-955-6000



HIGH-END TABLE-TOP HD RADIOS

Polk iSonic \$599 MSRP

Delivers the goods. All of them: XM/AM/FM/HD/TV/CD/DVD/MP3 with exceptional sound from clever 5-speaker arrangement. Sounds much larger than it is. Would be a superb audio system for a larger 16:9 screen computer with high speed connection and hi-rez display. Full review August 2007 *MT*. Order direct from Polk Audio 866-764-1801



MID-PRICED TABLE-TOP HD RADIOS

Cambridge SoundWorks \$299 MSRP

Best audio of mid-priced sets. Would be a great desk-top audio for computer and fantastic audio in bedroom, study or living room. Full review in September 2007 *MT*. Buy direct from Cambridge SoundWorks 800-367-4434.



Sony XDR-S3HD \$200-250 MSRP

Beautifully designed solid performer. Typical Sony quality and high price. Excellent audio. Full review in December 2007 *MT*. Available at a large number of retailers nationwide including Best Buy and Target.



Boston Acoustics Receptor \$299 MSRP

Audio not up to BA heritage or price tag. Odd satellite speaker arrangement. Full review in June 2007 *MT*. Available direct from BA 888-627-1444



LOWEST PRICED TABLE-TOP HD RADIOS

Radio Shack Accurian \$199 MSRP

Has smallest desk foot print of all. Audio is slightly better than Radiosophy HD-100. Full review in June 2007 *MT*. Available at most Radio Shack outlets.



Radiosophy HD-100 \$99 MSRP

Smallest of the HD sets. Looks like it should be a portable but isn't. Very small speakers lack bass. Full review on *MT* web site. Available direct from Radiosophy 877-443-7234.

MT REVIEW

You'll Get a Recharge out of This The LaCrosse BC-900

By Larry Van Horn, MT Assistant Editor

I must admit in recent years I have joined the technology revolution and become a bit of a gadget freak. Let's take a quick inventory: I have four handheld scanners, a GPS unit, two digital cameras, two FRS units, several cool flashlights, several remotes for the home entertainment system, three remote weather stations, and a laser pointer.

I really like and use all these gadgets, but a major problem is powering all these fun toys. After I purchased the first few, I soon realized that I was spending a small fortune in batteries. In fact, it was getting so expensive, I was expecting a personal invitation to attend the next stockholder meeting from that "Copper Top" company you see advertised on TV. So what is a fella to do?

Well, I decided that rechargeable batteries were the way to go. But I soon found that not all battery chargers, nor all batteries, are equal. Recently, while testing the new GRE PSR-500 handheld, I thought I had a battery life issue with the scanner. I contacted the development team and they pointed out that the battery life wasn't the issue, it was the batteries themselves.

One member of the team suggested that I look into getting a La Crosse Technology BC-900. He also had some concerns with battery life at first until he picked up a La Crosse BC-900 intelligent charger. Using this smart charger, he was able to determine that both of his primary sets of four AA NiMH batteries had a bad cell in each set! The BC-900 came to his rescue.

One Google search later and I had a BC-900 on its way to Brasstown. Yes, I know – another gadget!

❖ What is It?

The La Crosse Technology Alpha Power BC-900 Battery Charger and Recovery System is a compact, lightweight, and easy-to-use charger for all AA and AAA nickel-cadmium (NiCd) and nickel metal hydride (NiMH) rechargeable batteries. You can even use the AA batteries in devices that require C- and D-size batteries with the included adapters. Both AA and AAA batteries can be charged simultaneously, but the unit will not charge defective batteries.

With the BC-900, you eliminate the negatives of shortening a rechargeable battery's life by recharging it when it is not fully discharged and of overcharging it. The BC-900 is an intelligent charging unit that provides quick and optimum charging of your batteries. The unit has overheat detection to prevent overcharging.

An informative LCD display and large function keys (pushbuttons) are just two of many useful features on the BC-900 battery charger and recovery system.

The BC-900 has four battery compartments, each with a numbered key. There are number function keys used to select a particular battery compartment for charging and to display the operating mode. The mode key is used to select any of the four operating modes described below. The display key lets you scroll through the various displays. These are charging current (in mA), time elapsed (hh:mm), terminal voltage (in V), and accumulated capacity (in mAh or Ah).

In conjunction with the number keys, you can select the charging mode and view the displays individually for each battery compartment. Finally, the current key lets you select the amount of charging current to be applied if you wish it to be more than the factory-default 200 mA.

❖ Modes of Operation

In the charge mode, when you place a battery in the BC-900, the unit displays the voltage and the charge level of the battery. The unit then begins charging (at the factory-default 200mA) up to the maximum voltage and then switches to trickle charging when the battery is fully charged. As an alternative to automatic 200 mA charging in all four operating modes, you can manually select any of several higher charging currents, depending upon how many batteries are in the charger.

The discharge mode is used for removing the memory effects of rechargeable batteries. In this mode, the batteries are discharged and then recharged at lower current levels. Finally, the batteries are charged at their full capacity.

In refresh mode, old batteries and those that have not been used for a long time can be recharged. This mode recovers the optimum capacity of the rechargeable batteries by repeating discharging and charging cycles until no further increase in measured capacities occurs.

In the test mode, the batteries are first fully charged and then discharged to determine their capacities. Next, the batteries are charged again, and the capacity in mAh or Ah (milliamp-hours or amp-hours) is shown after the charging ends.

Trickle charging is a feature that automatically turns on when a charging cycle is complete. This keeps the batteries freshly charged until you need them.

❖ What's in the Box and Specifications?

The BC-900 package includes the charging unit, a 5-foot, 2-inch AC/DC adapter, one set of AA and AAA NiMH rechargeable batteries, C-size and D-size battery adapters, a black nylon travel/storage case, a quick set-up manual, detailed instruction manual, and other miscellaneous paperwork. Other specifications include:

- Charging current range: 200mA (default) to 1800mA, user-selectable
- Maximum charging capacity: 3000 mAh
- Input voltage for ac/dc adapter: 100 to 240Vac, 50 or 60Hz, 0.6A
- Adapter output: +3.0Vdc, 4.0A
- Charger dimensions: 3.0 inches (76 mm) high x 5.1 inches (126 mm) wide x 1.5 inches (38 mm) deep

❖ Bottom Line

This unit retails for \$79.95, but you can find deep discounts at various vendors online.

I was blown away with this battery charger. If you use a lot of batteries, then this unit is a must. This really cool charger has lots of features that are sure to satisfy the most technically minded among us. With its charging, discharging, refreshing, and capacity testing functions, as well as individual displays for its four charging compartments, the BC-900 battery charger is economical, reliable, user-friendly, and ideal for use in home or office and while traveling.



Recycled Technology

By Carl Herbert AA2JZ

How many times have you been to a "Hamfest" and passed by vintage "heavy duty" computer gear, such as tape storage units and old VHS players? Often these "elephants" are the remnants of systems used in years past, and were "state of the art" during their day. Here's what I did to give new life to an outdated clunker.

This magnetic tape storage unit began its life as a very expensive media storage device. A heavy aluminum "clam shell" case, measuring 16" x 8" x 3-1/2" (LWH) contained a circuit board and drive system for storage of digital data. A long, large device to be sure, that no longer meets the system requirements of today. The inner workings were of little value to me, and were removed, saving the hardware used to hold the unit together. Some cleaning was in order, and shortly I had a somewhat presentable aluminum enclosure ready for rehabilitation.

Well, now I've made this case somewhat presentable, but what to do with it?! One more trip to the "external storage facility" (a shed where I keep clunker finds away from the prying eyes of my bride) yielded a VHS tape player in various stages of disassembly.

The tape drive had long since been non-functional, but the electronics were still there. What was nice about this device was that the power supply board (analog type) was *almost* a separate board from the video portion of the player.

Following initial testing to prove that the power supply still functioned, I removed the transformer and power board for further investigation. In the 1960s, many manufacturers silk-screened information on their circuit boards, making identification of "power points" relatively easy. That was very nice of them, and I'm sure their technicians appreciated their efforts. While it had additional circuitry beyond the basic power supply area, I inspected the board and found that much of it could be cut away, without affecting the

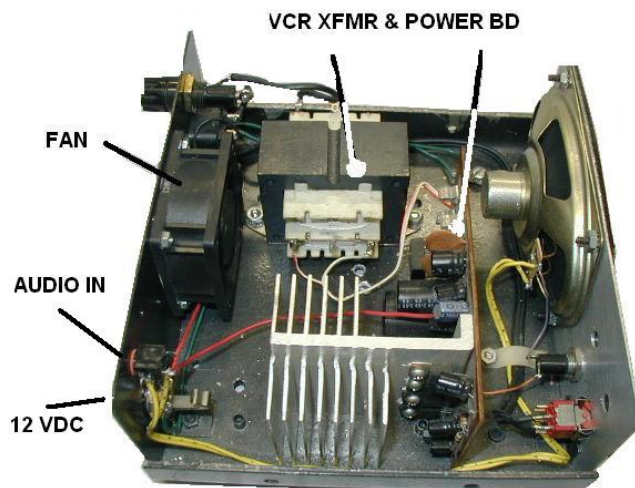
"Now I've made this case somewhat presentable, but what to do with it?!"

power supply portion. I used a hobby grinder to slice away the unwanted portion.

With the transformer and board free from their initial home, I placed them loosely in the bottom half of the tape drive case and "shuffled" them around to find the most

pleasing and functional locations for them. The power supply board was overly long for the width of the case, and the transformer needed some spacing from the board to be accessible. Remember to think about having enough space to install switches, etc. on the front of the project, plus space for output connectors and such on the rear. I decided that the length of the case required to comfortably house my new device would be 7-1/4 inches.

An electric jig saw was used to shorten the overly long case to the desired length, and some filing was needed to remove the burrs. Front and rear panels were cut from thin sheet metal to match the opening size



SPEAKER

AUDIO IN



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12 VDC

of the case, and attached with "L" brackets made from the same material.

That's a big, empty face plate to simply house a power switch and indicators, so I opted to include an 8 ohm speaker there for monitoring my 2 Meter rig output. This power supply project will be used to operate the VHF rig, so the speaker placement eliminated the need for having another separate one.

❖ Populating the Case

Now for the assembly mode! I like to spend time mentally arranging and rearranging the face plate and rear plate additions until I find a pleasing pattern. Careful measuring, marking, and drilling of the plates makes for a better looking project. The speaker grill was cut from the bottom sheet metal of the VHS player. Its original function was to provide air movement for cooling, but with careful measuring and cutting it became a decent looking grill.

The process is repeated for the rear panel. I included a cooling fan and an AC connector from a defunct computer power supply.

With the addition of the speaker on the front panel, and the fan and fuse holder on the rear, I'm glad I left a little "extra" room in the length of the case! I opted to include indicators for AC ON, 12 VDC, and 5 VDC on the front panel, and jacks for power output, speaker input and a ground lug on the

rear panel. Marking the locations for needed fasteners took a little time, as did the drilling and nibbling of holes required. Don't forget to add some air intake holes for the cooling fan to draw from. A "dry fit" of all the parts is recommended before painting.

Assembly and wiring of the project were almost an anticlimax. The new addition to my equipment adequately powers my 2 Meter HTX 252 FM rig. The VHS player was fused for 4 amps @125 VAC, and the rig is rated at 5 amps max in transmit. I used the 4 amp SLO-BLO fuse in the fuse holder, and thus far the transceiver has functioned without problems. The rig has two power settings, 10 watts and 25 watts, and I use the

lower setting to communicate with our local repeater. It doesn't take much to "trip" the repeater, and using less power doesn't affect my operation.

❖ Rewards of Recycling

Recycling available parts can be a rewarding process. While this power supply is of the analog type commonly used years ago, it has found a new home on my bench. Be watching for those "clunker" cases at ham-fests! Often they're either very inexpensive or free for the taking. Yes, you'll have to lug them away, but they make dandy housings for all sorts of electronic projects!

Happy building!

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Radio Tools at Your Fingertips Free Radio Toolbars for Your Browser

For me, the use of radios and computers together has always been a logical synergy of technologies, but I have to admit that, initially, the integration of the Internet into this community was not as obvious to me. However, over the past decade, the Internet has proven to be an indispensable addition to radio communications.

Just think of the way radio people use the Internet today! Up-to-the-minute frequency lists, current ham band “hot spots,” current propagation conditions, propagation forecasts, near instant distribution of communications software, instant distribution of updates and fixes to software, access to technology library resources and tutorials, even delivery of magazines (*MT Express*), and the list gets longer every day.

How would you like some help in collecting, cataloging and accessing important radio websites? If you use Firefox or Internet Explorer (IE), then help is already available, and it's FREE.

This month we will look at two toolbars that have been specifically tailored to radio communications.

❖ What's a Toolbar?

Good question. A toolbar is a customized list of links or bookmarks, which leads to websites and programs of a specific interest. It could be antique cars or jet aircraft. In our case the target is radio communications. A radio toolbar might have links to signal propagation sites, currently active frequencies and scheduled shortwave station broadcasts, to name a few.

Once installed, the toolbar appears as a horizontal bar near the top of our web browser. Contained in the toolbar are icons of the websites or programs of interest. Just a click and you are back to “that” important, indispensable website. Let's give a radio toolbar a try.

We'll use Firefox version 2.0.0.6, on a PC with a 1.6 GHz Duo Core T2060 CPU, 1.4GB of RAM with a Vista Home Basic operating system. And I can finally report our connection to the Internet is via high-speed cable, after a five-year wait!!

❖ Not Just For Hams

Clearly, many of the items of interest to amateur radio operator are also of interest to radio monitors. The HamLinks toolbar does a nice job of covering them both. Start the installation of the 380K program by selecting the “simply click here” on their website at www.n0hr.com/Ham_Radio_Toolbar.htm.

[n0hr.com/Ham_Radio_Toolbar.htm](http://www.n0hr.com/Ham_Radio_Toolbar.htm).

You may have to tell your pop-up, ad block or add-on installer to “allow” the process to continue. On some Windows versions the User Accounts Control may need your OK. According to McAfee Site Advisor report on this website, “We tested this site and didn't find any significant problems.”

Firefox had to be restarted it for the HamLink toolbar to appear. The first time you restart your browser after HamLink's installation, you are presented with three setup choices. I checked and added the first “Add Hamlinks Web Search to the Firefox Search Box.” The second item “Use Hamlinks's Web Search as the Browser Default Search Engine” I did not choose, since I use my computer for many things, not only radio. If you have a dedicated “radio computer” you may want to select this item.

Finally, since I value and jealously guard my privacy, the last choice “Send Usage Statistics,” also was not selected.

That's all it takes to get the Hamlink toolbar operational. Now Hamlink toolbar will appear below your “navigation toolbar.” The navigation toolbar is where the address of the current website is displayed. Figure 1 shows Firefox with the Hamlink toolbar. Let's go over some of its icons and see how valuable they can be to us “radio-types.”

❖ Using Hamlink

The “Blue Car” icon brings you to the N0HR website and their other program offerings. Many of the links found on this toolbar refer back to the N0HR site.

Look at the search window, which is situated to the left of the car icon. Clicking the magnifying glass displays a dropdown menu of radio-related websites. These include:



Figure 1 – The Hamlink Toolbar is visible below the navigation tool bar on Firefox.

- QRZ.com (callsign searches)
- DXwatch (“hot” spot searches)
- QSL Manager (lookup dx callsigns)
- FindU.com (APRS location information with a call search)
- Ham Radio Links (links directory)
- Product reviews
- Ham Radio Classifieds at eHam and QTH.com

Once a site is selected, you can search that site for a specific topic. Enter the topic in the window and hit “GO.” Special search results can be highlighted using the “yellow marker” to the left of “GO.”

Now try clicking the Ham Radio Links “Antenna” icon. Here links are grouped by topic: Classified, Contesting, Directories, DXing, Organizations, Portals, Propagation and QSLing. These then branch to accessible sites. Figure 2 displays the branching of the Propagation topic into four accessible sites.

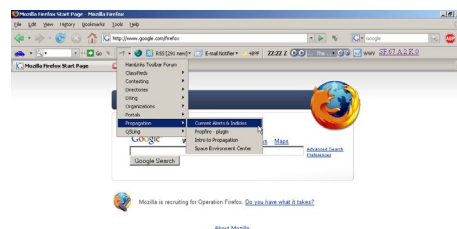


Figure 2 – The “Antenna” Icon on Hamlink where links are grouped by topic

Don't Stop Now

Next, select the Globe to display a map of upcoming DXpeditions. DXpeditions are hams that are temporarily operating a ham radio station in some exotic part of globe. Hovering over the dot locations on the resulting map displays more detailed information about the station.

Radio blogs and feeds can connect you to hundreds of radio-related sites and fill your browser with everything you've ever wanted to know about radio...well just about. As you can see from the next icon, two hundred and ninety-one blogs and feeds are in the current list and can be accessed with a few clicks.

Speak to Me

Moving past the next icons for Email

notification, local weather and time, we arrive at the ham radio podcasts area. There are many radio-related podcasts produced daily. Hamlink provides a podcast player so you can listen to them over your computer's speakers.

Click on the small down arrow in the grayed-out window to the left. A list of radio Podcasts, such as "This week in amateur radio" will be displayed. It's easy to add your favorite podcasts to the list. Select a podcast, then click the right pointing arrow and you will be enjoying the audio in seconds!

The podcast player is a very nice feature of Hamlink. Its operation is simple and flawless. ActiveX file for your browser installed must be installed for the podcast to operate.

Propagation – NOW

The "graph" icon to the left of the podcast player displays the latest geophysical alerts from WWV. For real-time propagation information, check out the next set of three numbers to the left of WWV. Here, the solar flux (SF), the Earth's magnetic field A index and K index are displayed. Clicking on these numbers will load a web page with in-depth information on how to interpret them. Very slick!

❖ Next Up! HamInfoBar

As the website of this radio toolbar says, "HamInfoBar has been designed primarily for the radio enthusiast providing a wealth of information for radio hams and SWLs, whilst retaining the properties of a conventional toolbar." It is available for either Firefox and Internet Explorer at www.haminfobar.co.uk/.

McAfee Site Advisor says, "We have not yet reviewed this site." However, I have not noticed any malware or problems after downloading, installing and using HamInfoBar with Firefox. Once again, you may have to tell your pop-up, ad block, add-on installer and/or User Account Manager to "allow" the downloading process to continue to a successful conclusion. Then restart your browser.

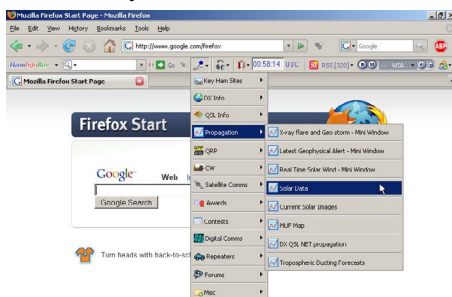


Figure 3 – HamInfoBar's toolbar at first look similar to Figure 1. But look closer!

Things That Make You Go Ummm

Once Firefox is restarted, the first thing you are presented with is a box of three option choices. Sound familiar? Exactly the same screen as in Hamlink. Hmmmm. Undaunted, I repeated the same yes, no, no sequence of choices and started the program. Quite frankly, I expected to see the same toolbar as in Hamlink!

If you look at Figure 3, you'll see that there are similarities, especially in the first icons on the left and the last ones on the right. The similarities may be a result of both authors using the same construction software. In any case, there are many interesting differences, as we'll see.

Ham Help

The microphone icon addresses a gamut of ham radio needs. See Figure 3. It contains links to Key Ham Sites, DX Info, QSL Info, Propagation, QRP (low power), CW, Satellite Comms, Awards, Contests, Digital Comms, Repeaters, Forums, and Miscellaneous. Each breaks down into a number of specific websites: very comprehensive. Again, many of these topics are of great interest to shortwave monitors, for example, Ham Radio Propagation.

SWLer - Not Forgotten!

Parts of HamInfoBar have been designed specifically for the shortwave listener. Clicking on the headphone to the left of the microphone, drops down the "SWL" menu. Welcome, radio monitors! Now visible are six SWL topics, each of which expand into a number of accessible links. Figure 4 displays the SWL-Radio-SW Broadcast Schedule link.

The rest of the SWL-Radio menus – SW News, Radio Station Worlds, Glenn Hauser's World of Radio, British DX Club, DAB, Interval Signals Online and QSL Card Museum – all have many sites that will be of great interest and use to SWLers.

And remember, there are five more sub-menus under the main SWL menu, meaning lots more SWL sites!



Figure 4 – Catering to shortwave listeners – HamInfoBar's SWL icon.

More for Everyone

The book icon (Reference) to the left of the headphones displays four topics that will be useful to both hams and SWLers. These include: Equipment, Maps, Organizations and World Info. Figure 5 displays the two sites, which result from the path Reference – Maps – Grey Line Map. This icon can lead you to a wealth of radio information!

Podcast Player – Flashback

HamInfoBar's podcast player looks and works exactly as the Hamlink player. I have not used podcast for many years. Then I was disappointed with the quality and variety of the programming. But I must say that after listening some of these podcasts, I'm now hooked on the

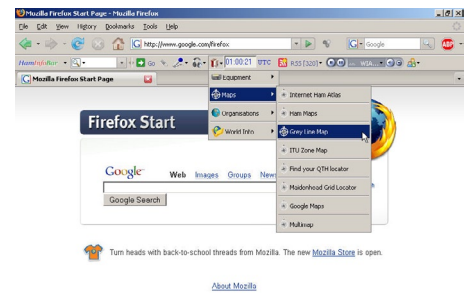


Figure 5 – The reference icon. All you need to know about radio.

medium.

The radio blogs and feed icon operated the same in both toolbars. But HamInfoBar seemed to have blogs and feeds specifically for *both* hams and radio monitors.

❖ Had Enough Yet?

If you are not on information overload yet, you should be! Both toolbars are very well behaved and caused no problems. Either one or both of these add-on toolbars will make a great useful addition to any ham's or radio monitor's computer.

And remember, these are being provided free of charge, so give them a try. If you contact Hamlink or HamInfoBar, remember to thank them for their efforts, and tell them that you saw it in the *Computers & Radio* column of *MT*. Come to think of it, ask the authors of these fine radio toolbar add-ons ... Hey, where is the *Computers & Radio* or *Monitoring Times* link?!

❖ Till Next Time

Happy New Year 2008 to all. May it be a better year of peace, respect and living conditions for ALL truly needy people on this small planet.

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What's NEW

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ARRL Handbook

Without question, the leading, most authoritative and comprehensive reference work on radio communications for the hobbyist is the *ARRL Handbook for Radio Communications* now in its 85th Edition for 2008. This exhaustive, over-1100-page compendium is liberally illustrated with thousands of photos, charts, diagrams, graphs, and other visual aids.

This new edition includes two free CDs: *ARRL Handbook (V12.0)*, and *ARRL Software Library for Hams (V2.0)*. Both discs are self loading and include Adobe software to read the files.

The *Handbook* contents range from an introduction to ham radio for the newcomer with emphasis on safety, electrical fundamentals and ham activities, on to advanced projects in digital and satellite communications.

But it's the in-between chapters that will be of the greatest interest to most readers – subjects like transmitter and receiver circuit design and construction, addressed stage by stage; power supplies and high-power amplifiers; antennas and transmission lines; interference location and direction finding; test equipment and troubleshooting circuitry; DSP and software design and more.

Each year the editors of the *Handbook* update the tome, adding subject matter and revising the evolving technology. The *Handbook* is an indispensable publication for the serious radio adventurer. #1018, \$44.95 plus shipping from the ARRL Book Store, 225 Main Street, Newington, CT 06111-1494. Or order from their website at: www.arrl.org/catalog.

Reviewed by Bob Grove

Passport to World Band Radio

The *New York Times* has called *Passport to World Band Radio* the "TV Guide for world band radio" – and rightly so. This year's 2008 edition is now available as a companion reference guide for the novice and seasoned hobbyist.

Features highlight two regions of the Sahara. First is *Casbah Radio*, an in-depth focus on broadcasting from Tangier by hobbyist Henrik Klemetz. Global religious broadcaster Trans World Radio also had its start in Tangier, but now has a global focus from several transmitter sites. Jock Elliott delves into TWR's broadcasting operations.

Getting Started will guide the newcomer through the basics of world band including *Time/Day*, *Finding Stations* and *The Right Radio*. *Ten of the Best: 2008's Top Shows* may have you scurrying to the receiver to enjoy the best of the best in shortwave programming, and *What's On Tonight* features an hour-by-hour guide to programming.

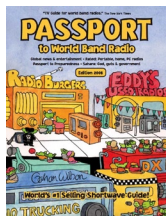
Shortwave radios can vary greatly depending on your budget and space limitations. *Passport* updates the hobbyist in *How to Choose a World Band Radio*, *Portables for 2008*, and *Professional Receivers for 2008*. Reviews are presented in a clear and concise style, including observations both pro and con. Whether using a portable or outside wire antenna, your needs and space restrictions are addressed in two antenna features: *Wire Antennas* and *Compact Antennas for 2008*.

Addresses Plus contains a by-country guide of station addresses, who's who, websites, items for sale and more, followed by *Worldwide Broadcasts in English-2008*. Find out what shows are on, by-country and by-hour.

Passport's Blue Pages are a by-frequency listing of world band frequencies from 2310 to 21840 kHz. The *Blue Pages'* signature graphic chart helps listeners quickly narrow their search by country, station, broadcast hours, language and targeted areas.

Passport to World Band Radio is a very good reference aid for any DXer, providing equipment advice on receivers and antennas, and frequency and tuning advice for your shortwave radio journey.

Passport to World Band Radio 2008 (BK-18-08) is available through many dealers, including Grove Enterprises www.grove-ent.com (or



1-800-438-8155 for \$22.95 + \$3.00 s/h.

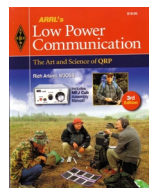
Reviewed by Gayle Van Horn

Low Power Communications

Rich Arland W3OSS should be very familiar to *MT* readers (as a former member of the *MT* writing staff), and to readers of other radio-related publications as well. This third edition of Arland's *Low Power Communication* is packed with every conceivable aspect of operating QRP (reduced power levels) on the amateur radio bands.

Restoring antique and military radio gear, emergency communications, designing multiband antennas, planning the contents of portable packs, determining the best times for proper propagation, CW and phone practices for improved contacts, kit building, DXpeditions, and more pepper this handy, informative, well-illustrated, 330 page reference on the art of communicating at low power. #1042, \$19.95 plus shipping from the ARRL Book Store, 225 Main Street, Newington, CT 06111-1494. Or you may order from their website at www.arrl.org/catalog.

Reviewed by Bob Grove
and in On the Ham Bands



Construction Articles

The Xtal Set Society, dedicated to "once again" building and experimenting with radio electronics, has been publishing a newsletter bi-monthly since July of 1991. You can purchase entire volume sets from 1991-2003, or individual issues from 2003 to the present by going on line to their website at

science.com.

Best of all, you can search through the list of over 300 articles for your topic of interest. Use the FIND command to look for key words of interest within the titles of the articles, such as "field strength meter." The listing demonstrates the wide range of interests among crystal enthusiasts, who may be builders, theorists, bench jockeys, historians, or testers, etc. The list of articles is also printable via your browser.

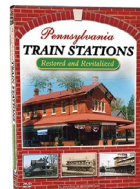
For additional information, visit the site or email xtalset@sunflower.com or write The Xtal Set Society, P.O. Box 3636, Lawrence, KS 66046; or call 405-517-7347.

Pennsylvania Train Stations on DVD

There is something simply mystical about train stations. A walk through the corridors of one of these magnificent buildings is like stepping back in time to the early 1900s. America's train stations served as a backdrop for many mileposts in our country's history.

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Pennsylvania Train Station is available at www.Amazon.com (on sale at \$12.99) and at many other online and retail stores. For more information or a trailer of the film, visit their website: www.incom.com/products/consumer/trainstationsfilm/

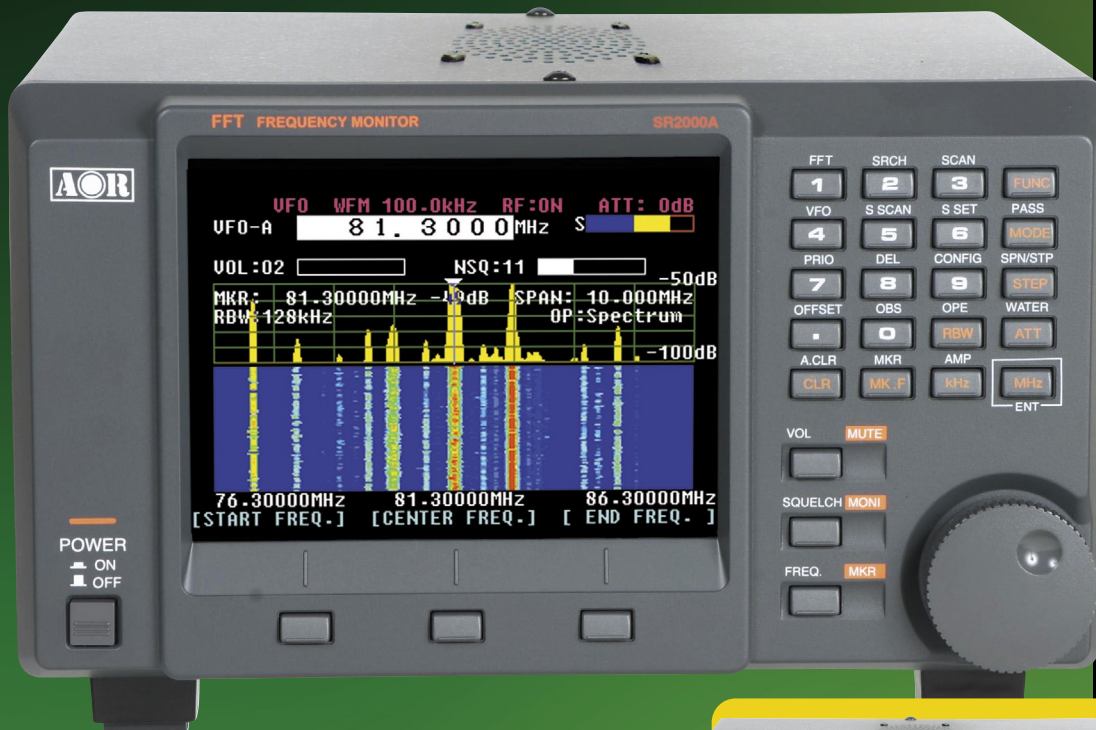


Books and Equipment for announcement or review should be sent to What's New, c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to Larry.Van.Horn@monitoringtimes.com

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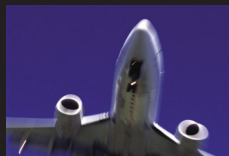
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<http://mt-editor.blogspot.com/> - by Rachel Baughn
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<http://mt-fedfiles.blogspot.com/> - by Chris Parris
MT: MILCOM
<http://mt-milcom.blogspot.com/> - by Larry Van Horn
Larry's Monitoring Post
<http://monitor-post.blogspot.com/> - by Larry Van Horn
MT: SHORTWAVE
<http://mt-shortwave.blogspot.com/> - by Gayle Van Horn
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